CT Tree Warden School Training Session

Resource Materials for Presentations by
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Safety
OSHA Standards
ANSI Standards

PRUNING STANDARDS

With the American National Standard for pruning, ANSI A300, specifications can be written in a virtual infinite number of combinations. The following information is designed to help you understand exactly what will be accomplished in a pruning operation.

Branch Size

A minimum or maximum diameter size of branches to be removed should be specified in all pruning operations. This establishes how much pruning is to be done.

Pruning Objectives

Pruning objectives should be established prior to beginning any pruning operation. A300 provides two basic objectives.

Hazard Reduction Pruning

Hazard reduction pruning (HRP) is recommended when the primary objective is to reduce the danger to a specific target caused by visibly defined hazards in a tree. For example, HRP may be the primary objective if a tree had many dead limbs over a park bench.

Maintenance Pruning

Maintenance pruning (MP) is recommended when the primary objective is to maintain or improve tree health and structure, and includes hazard reduction pruning. An example here might be to perform a MP operation on a front yard tree.

Pruning Types

Hazard reduction pruning and maintenance pruning should consist of one or more of the pruning types noted below.

_____ **Crown cleaning**....Crown cleaning shall consist of the selective removal of one or more of the following items: dead, dying, or diseased branches, weak branches and watersprouts.

_____ **Crown thinning**....Crown thinning shall consist of the selective removal of branches to increase light penetration, air movement, and reduce weight.

_____ **Crown raising**....Crown raising shall consist of the removal of the lower branches of a tree to provide clearance.

_____ **Crown Reduction, or Crown Shaping**....Crown Reduction decreases the height and/or spread of a tree. Consideration should be given to the ability of a species to sustain this type of pruning.

_____ **Vista Pruning**....Vista Pruning is selective thinning of framework limbs or specific areas of the crown to allow a view of an object from a predetermined point.

_____ **Crown Restoration**....Crown Restoration pruning should improve the structure, form and appearance of trees which have been severely headed, vandalized, or storm damaged.

Example Specifications

Tree: 24 inch dbh Oak in back yard of residence. Maintenance Prune - Crown clean 2 inches or greater, crown thin branch in east side over pool.

Trees: Nine, 20 to 25 inch silver maples on street. Hazard Reduction Prune - Crown clean 3 inches or greater, Crown raise to 15 feet (Figures 1 & 2).

Tree: 30 inch White Pine in back yard, overlooking sea. Maintenance Prune - Crown Clean 2 inches or greater, Vista Prune south side to improve view of sea.

Tree: 10 inch Redbud in front yard. Maintenance Prune - Crown thin, 1/2 inch or greater.

Tree: 19 inch red maple in back yard. Hazard Reduction Prune - Crown clean dead wood only 2 inches or greater, Crown reduction prune away from antenna on house.

The American National Standard for tree pruning is ANSI A300. Its development process was approved by the American National Standards Institute. This pruning standard should be followed where possible in all pruning situations to remain consistent with industry standards. Please note that the A300 standard has been drafted to address pruning specifications across all geographic areas. Knowledge of the growth habits of certain tree species within a given environment may alter how the recommendations of A300 are interpreted.

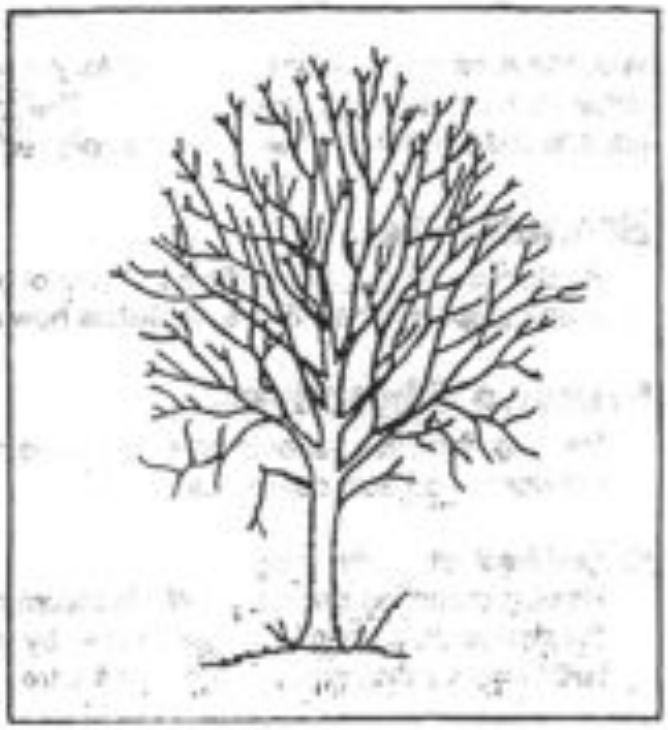

Figure 1 (above). Tree before pruning.

Figure 2 (below). Tree after Hazard Reduction Prune - Crown clean 3 inches or greater, Crown raise to 15 feet.

American National Standard for Arboricultural Operations

Pruning, Repairing, Maintaining, and Removing Trees, and Cutting Brush – Safety Requirements

1 General

1.1. Scope

This Standard contains arboriculture safety requirements for pruning, repairing, maintaining, and removing trees; cutting brush; and for using equipment in such operations.

1.2 Purpose

The purpose of this Standard is to provide safety criteria for arborists, other workers, and the public. It is intended as a guide to Federal, state, and local authorities in drafting their regulations and may be adopted in whole or in part.

1.3 Application

This Standard is intended to apply to all employers engaged in the business, trade or performance of tree pruning, repairing, maintaining, removal, or brush cutting who hire one or more persons to perform such work. This Standard serves as a reference for safety requirements for those engaged in pruning, repairing, maintaining, or removing trees or cutting brush. This Standard may require situational modifications in response to personnel emergencies and is not intended to limit the options available to emergency responders.

1.4 Responsibilities of the Employee

Each person, employee or other, shall be responsible for his/her own safety while on the job site and shall comply with the appropriate Federal or state occupational safety and health standards and all rules, regulations, and orders which are applicable to his/her own actions and conduct.

2 Normative References

The following Standards contain provisions, which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All Standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the Standards indicated below.

Because of the many specialized operations utilized during professional tree care operations, it must be emphasized that exceptions to provisions of these Standards may be acceptable and may require a flexible and/or applicability judgment decision for these professional operations.

Informative (Refer to Annex D)

ANSI A10.14-1991, *Requirements for safety belts, harnesses, lanyards, lifelines, and drop lines for construction and industrial use.*

ANSI A14.1-1982, *Ladders - Portable wood - Safety requirements*

ANSI A14.2-1990, *Ladders - Portable metal - Safety requirements*

ANSI A1264.1-1989, *Safety requirements for workplace floor and wall openings, stairs and railing systems*

ANSI B175.1-1991, *Power tools - Gasoline-powered chain saws - Safety requirements*

ANSI Z87.1-1989, *Practice for occupational and educational eye and face protection*

ANSI Z88.2-1992, *Practices for respiratory protection*

ANSI Z89.1-1986, *Personnel protection - Protective headwear for industrial workers - Requirements*

ANSI/SIA A92.2-1990, *Vehicle-mounted elevating and rotating aerial device*

29 CFR 1910.269, *Electric power generation, transmission, and distribution* [1]

Cordage Institute specifications[2]

[1] Available from U.S. Department of Labor, OSHA, 200 Constitution Avenue, NW, Washington, DC 20201.
[2] Available from the Cordage Institute, 350 Lincoln Street, Hingham, MA 02043.

3 Definitions

3.1 approved: Acceptable to the Federal, state, or local jurisdiction having enforcement authority.

3.2 arboriculture: The art, science, technology, and business of utility, commercial, and municipal tree care.

3.3 arborist: An individual engaged in the profession of arboriculture.

3.4 arborist saddle: A harness of the Type II design used as part of the climbing system to secure an arborist while aloft.

3.5 arborist climbing line: Arborist climbing lines shall have a minimum diameter of 1/2 inch (12.5 mm) and be constructed of a synthetic fiber, with a minimum nominal breaking strength of 5,400 pounds (24 kN) when new. Maximum working elongation shall not exceed 7 percent at a load of 540 pounds (2.4 kN). Arborist climbing lines shall be identified by the manufacturer as suitable for tree climbing.

EXCEPTION: In arboricultural operations not subject to regulations that supersede Z133.1, a line of less than 1/2 inch diameter (12.5 mm) may be used, provided the employer can demonstrate it does not create a safety hazard for the arborist and the arborist has been instructed in its use. The strength and elongation ratings of the line selected shall meet or exceed that of 1/2 inch arborist climbing line.

3.6 belay: Secured roping technique managed by the groundperson, to safeguard the arborist while climbing.

3.7 carabiner, positive-locking: A carabiner, which upon closing, automatically moves into the locked position which requires a minimum of two separate operations to prepare the gate to open. For example, having to move the thimble up or down before the thimble can be rotated into the position that will permit the gate to be depressed into the "open" position.

3.8 climbing hitch: A hitch used for securing a tree climber to the climbing line, permitting controlled ascent, descent and work positioning. Examples of climbing hitches include, but are not limited to: taut-line hitch, Blake's hitch and the Prusik hitch.

3.9 drop start: The act of starting a chain saw by pushing the saw away from the body with one hand while simultaneously pulling on the starter cord handle with the other.

3.10 electrical conductor: Any overhead or underground electrical device capable of carrying an electric current, including communications wires and cables, power lines, and other such fixtures or apparatus.

3.11 electrical hazard: An electrical hazard exists when a worker, tool, tree, or any other conductive object is closer than 10 feet (3.05 meters) from an energized overhead electrical conductor rated 50 kV, phase-to-phase or less, or closer than 10 feet + 4/10 inch (3.05 meters + 10 mm) for each kilovolt over 50 kV. When an electrical hazard exists, minimum approach distances shall be maintained and only qualified line-clearance arborists or qualified line-clearance arborist trainees shall perform the work within proximity of electrical conductors.

3.12 electrical system owner/operator: An organization that operates or controls the distribution and/or transmission of electric power through electrical conductors.

3.13 false crotch: A system used to support an arborist climbing line other than a natural crotch. A false crotch shall incorporate rings or a pulley, or some other device that will protect the system and/or arborist climbing line from damage or failure. Each component of the system shall have a minimum tensile strength of 5,000 pounds.

3.14 job briefing: The communication of at least the following subjects for arboricultural operations: hazards associated with the job, work procedures involved, special precautions, electrical hazards, job assignments and personal protective equipment.

3.15 lanyard, tool: Short line or strap used to secure a tool while working aloft.

3.16 lanyard, work positioning (buck strap/flip line): A rope or strap designed as a work-positioning aid. (Wired-cored flip lines or lanyards or those constructed of conductive material shall not be used in proximity to energized conductors.)

3.17 leg protection: Personal protective equipment intended to reduce the risk of injury to the legs during chain saw operations.

3.18 line clearance: Pruning, or removing trees, shrubs or vines growing or existing in proximity to electrical conductors and their necessary supporting or containing structures in order to prevent such growth from interfering with electrical distribution.

3.19 manual land clearing: The removal of trees, shrubs or vines using chain saws or other cutting tools where there are no structures or objects which need to be avoided and pull lines are not used to pull or drop a tree and/or trunk to the ground.

3.20 minimum approach distance: Safe working distances from overhead electrical conductors as defined in Tables 1 and 2 of this Standard.

3.21 proximity: An area within 10 feet (3.05 meters) of energized overhead electrical conductors rated 50 kV phase-to-phase or less. For overhead electrical conductors rated over 50 kV phase-to-phase, the distance shall be increased 4 inches (10 cm) for each additional kV.

3.22 Prusik knot: A sliding friction knot.

3.23 Prusik loop: An endless loop of rope used to fashion the Prusik knot. The endless loop may be spliced or knotted with, at minimum, a double fisherman's knot. The breaking strength of the loop shall meet minimum strength criteria for an arborist climbing line.

3.24 qualified arborist: An individual who, by possession of a recognized degree, certification, or professional standing, or through related training and on-the-job experience, is familiar with the equipment and hazards involved in arboricultural operations and who has demonstrated ability in the performance of the special techniques involved.

3.25 qualified arborist trainee: An individual undergoing on-the-job training who, in the course of such training, is familiar with the hazards and equipment involved in arboricultural operations and who has demonstrated ability in the performance of the special techniques involved. This individual shall be under the direct supervision of a qualified arborist.

3.26 qualified line-clearance arborist: An individual who, through related training and on-the-job experience is familiar with the equipment and hazards in line clearance and has demonstrated the ability to perform the special techniques involved. This individual may or may not be currently employed by a line-clearance contractor.

3.27 qualified line-clearance arborist trainee: An individual undergoing line-clearance training and who, in the course of such training, is familiar with the equipment and hazards in line clearance and has demonstrated ability in the performance of the special techniques involved. This individual shall be under the direct supervision of a qualified line-clearance arborist.

3.28 qualified personnel: An individual who, by reason of training and experience, has demonstrated the ability to safely perform assigned duties and, where required, is properly licensed in accordance with Federal, state, or local laws and regulations.

3.29 secured: When an arborist is safeguarded from unintended movement utilizing a climbing system that is attached to the arborist and connected to a tree or other stable support. Examples of being secured include but are not limited to:

(1) when tied in

(2) when using a work-positioning lanyard

(3) when on belay

(4) when ascending the arborist climbing line using the footlock technique while utilizing a Prusik loop or ascenders.

3.30 shall: As used in this Standard, denotes a mandatory requirement.

3.31 should: As used in this Standard, denotes an advisory recommendation.

3.32 step potential: The voltage between the feet of a person standing near an energized grounded object. A person could be at risk of injury during an electrical fault simply by standing near the grounding point or points.

3.33 tied in: The term that describes an arborist whose climbing line has been run through a natural or false crotch attached to an arborist's saddle and completed with a climbing hitch or mechanical de-

vice, permitting controlled movement and work positioning.

3.34 worker: An individual involved in arboricultural operation such as ground operations, equipment operations, and removal operations.

NOTE: A glossary of additional terms is given in Annex A.

4 General Safety Requirements

4.1 General

4.1.1 Tools and equipment shall conform with the requirements of this Standard.

4.1.2 Employers shall instruct their employees in the proper use, inspection and maintenance of tools and equipment, including ropes and lines, and shall require that appropriate working practices be followed.

4.1.3 A job briefing shall be performed by the qualified arborist in charge before the start of each job. The briefing shall be communicated to all affected workers. An employee working alone need not conduct a job briefing. However, the employer shall ensure that the tasks are being performed as if a briefing were required.

4.2 Personal Protective Equipment

4.2.1 Personal protective equipment as outlined in section 4.2 shall be required where there is a reasonable probability of injury or illness that can be prevented by such protection.

4.2.2 Workers engaged in arboricultural operations shall wear head protection that conforms to ANSI Z89.1. Class E helmets shall be worn when working in proximity to electrical conductors, in accordance with ANSI Z89.1. Workers shall not place reliance on the dielectric capabilities of such helmets (head protection).

4.2.3 Face protection shall comply with ANSI Z87.1.

4.2.4 Respiratory protection shall comply with ANSI Z88.2.

Hearing protection:

4.2.5 When noise levels exceed acceptable standards, as established by Federal regulations, the employer should take appropriate measures to suppress noise levels. Approved hearing protection as provided by the employer shall be worn when it is not practical to decrease the level of or isolate the noise.

4.2.6 Eye protection in accordance with ANSI Z87.1 shall be worn when engaged in arboricultural operations.

4.2.7 Clothing and footwear appropriate to the known job hazards shall be approved by the employer and worn by the employee.

4.2.8 Chain saw-resistant leg protection shall be worn while operating a chain saw during ground operations.

4.3 Emergency Procedure and Readiness

4.3.1 A first-aid kit, adequately stocked and maintained, shall be provided by the employer, when and where arboricultural operations are being carried on. Arborists and other workers shall be instructed in its use and specific location.

4.3.2 Instruction shall be provided in the identification, preventive measures and first-aid treatment of common poisonous plants (poison ivy, poison oak and poison sumac), stinging/biting insects and other pests indigenous to the area in which work is to be performed.

4.3.3 Training shall be provided in emergency response procedures appropriate and applicable to the work to be performed.

4.3.4 Cardiopulmonary resuscitation (CPR) and first-aid training should be provided in the absence of an infirmary, clinic or hospital near to the work site.

4.4 Traffic Control

4.4.1 Effective means for controlling pedestrian and vehicular traffic shall be instituted on every job site where necessary in accordance with U.S. Department of Transportation (DOT) Manual on Uniform Traffic Control Devices (MUTCD), or applicable state and local laws and regulations.

4.4.2 Traffic-control devices used in tree operations shall conform to the applicable Federal and state regulations.

4.5 Fire Protection

4.5.1 Gasoline-powered equipment shall be refueled only after the engine has stopped. Spilled fuel shall be removed from equipment before restarting.

4.5.2 Gasoline-powered equipment shall not be operated within 10 feet (3.05 meters) of refueling operations or areas in which refueling has recently taken place.

4.5.3 Flammable liquids shall be stored, handled and dispensed from approved containers.

4.5.4 Smoking shall be prohibited when handling or working around flammable liquids.

4.5.5 Clothing contaminated by flammable liquid shall be changed as soon as possible. Open flame and other sources of ignition shall be avoided.

5. Electrical Hazards

5.1 General

All overhead and underground electrical conductors and all communication wires and cables shall be considered energized with potentially fatal voltages.

5.1.1 Arborists and other workers shall be instructed that:

(1) A direct contact is made when any part of the body touches or contacts an energized electrical conductor.

(2) An indirect contact is made when any part of the body touches any conductive object in contact with an energized electrical conductor.

(3) An indirect contact can be made through conductive tools, tree branches, trucks, equipment or other conductive objects, or as a result of communication wires and cables, fences or guy wires being accidentally energized.

(4) Electric shock will occur when a worker, by either direct or indirect contact with an energized electrical conductor, energized tree limb, tool, equipment or other object, provides a path for the flow of electricity to a grounded object or to the ground itself. Simultaneous contact with two energized conductors phase to phase will also cause electric shock that may result in serious or fatal injury.

(5) Electrical shock may occur during a ground fault simply by standing near the grounding object (for example, an uninsulated boom comes in contact with conductor with outriggers down).

5.1.2 If the minimum approach distance in Tables 1 and 2 cannot be maintained during arboricultural operations, electrical system owner/operator shall be advised before any work is performed in proximity to energized electrical conductors. This shall not apply to individuals working on behalf of, or employed by, the electrical system owner/operator.

5.2 Working in Proximity to Electrical Hazards

5.2.1 An inspection shall be made by a qualified arborist to determine whether an electrical hazard exists before climbing, or otherwise entering, or performing work in or on a tree.

5.2.2 Only qualified line-clearance arborists or qualified line-clearance arborist trainees shall be assigned to work where an electrical hazard exists. Qualified line-clearance arborist trainees shall be under the direct supervision of qualified line-clearance arborists.

5.2.3 A second qualified line-clearance arborist or line-clearance arborist trainee shall be within vision or voice communication during line-clearing operations aloft when line-clearance arborists or line-clearance arborist trainees must approach closer than 10 feet (3.05 meters) to any energized electrical conductor in excess of 750 volts (primary conductor) or when:

(1) Branches or limbs being removed cannot first be cut (with a pole pruner/pole saw) to sufficiently clear electrical conductors, so as to avoid contact.

(2) Roping is required to remove branches or limbs from such electrical conductors. This does not apply to individuals working on behalf of, or employed by, electrical system owners/operators engaged in line-clearing operations incidental to their normal occupation.

5.2.4 Qualified line-clearance arborists and line-clearance arborist trainees shall maintain minimum approach distances from energized electrical conductors in accordance with Table 1.

5.2.5 All other arborists shall maintain a minimum approach distance from energized electrical conductors in accordance with Table 2.

5.2.6 Branches hanging on an energized electrical conductor shall be removed using non-conductive equipment.

Table 1 – Minimum approach distances from energized conductors for qualified line-clearance arborists and qualified line-clearance arborist trainees

Nominal voltage kV phase-to-phase	Includes 1910.269 elevation factor, sea level to 5000 ft[1]		Includes 1910.269 elevation factor, 5001–10,000 ft[1]		Includes 1910.269 elevation factor, 10,001–14,000 ft[1]	
	ft-in	m	ft-in	m	ft-in	m
0.05 – 1.0	Avoid contact		Avoid contact		Avoid contact	
1.1 – 15.0	2-04	0.71	2-08	0.81	2-10	0.86
15.1 – 36.0	2-09	0.84	3-02	0.97	3-05	1.04
36.1 – 46.0	3-00	0.92	3-05	1.04	3-09	1.14
46.1 – 72.5	3-09	1.14	4-03	1.30	4-07	1.40
72.6 – 121.0	4-06	1.37	5-02	1.58	5-07	1.70
138.0 – 145.0	5-02	1.58	5-11	1.80	6-05	1.96
161.0 – 169.0	6-00	1.83	6-10	2.08	7-05	2.26
230.0 – 242.0	7-11	2.41	9-00	2.75	9-09	2.97
345.0 – 362.0	13-02	4.02	15-00	4.58	16-03	4.96
500.0 – 550.0	19-00	5.80	21-09	6.63	23-06	7.17
765.0 – 800.0	27-04	8.34	31-03	9.53	33-10	10.32

[1] Exceeds phase-to-ground; elevation factor per 29 CFR 1910.269.

Table 2 – Minimum approach distances to energized conductors for persons other than qualified line-clearance arborists and qualified line-clearance arborist trainees

Nominal voltage kV phase-to-phase[1]	Distance	
	ft-in	m
0.0 – 1.0	10-00	3.05
1.1 – 15.0	10-00	3.05
15.1 – 36.0	10-00	3.05
36.1 – 50.0	10-00	3.05
50.1 – 72.5	10-09	3.28
72.6 – 121.0	12-04	3.76
138.0 – 145.0	13-02	4.00
161.0 – 169.0	14-00	4.24
230.0 – 242.0	16-05	4.97
345.0 – 362.0	20-05	6.17
500.0 – 550.0	26-08	8.05
785.0 – 800.0	35-00	10.55

[1] Exceeds phase-to-ground.

5.2.7 The tie-in position should be above the work area and located in such a way that a slip would swing the arborist away from any energized electrical conductor or other identified hazard.

5.2.8 While climbing, the arborist should climb on the side of the tree that is away from energized electrical conductors as required in Tables 1 and 2.

5.2.9 Footwear, including lineman's overshoes, having electrical-resistant soles, shall not be considered as providing any measure of safety from electrical hazards.

5.2.10 Rubber gloves, with or without leather or other protective covering, shall not be considered as providing any measure of safety from electrical hazards.

5.2.11 Ladders, platforms and aerial devices, including insulated aerial devices, shall be subject to minimum approach distances in Tables 1 and 2.

5.2.12 Aerial devices and attached equipment (such as chippers) contacting energized electrical conductors shall be considered energized. Contact shall be avoided, except where emergency rescue procedures are being carried out. Emergency rescue should be performed in accordance with 4.3.

5.3 Storm Work and Emergency Conditions – Line Clearance

5.3.1 Line clearance shall not be performed during adverse weather conditions such as thunderstorms, high winds and snow and ice storms.

5.3.2 Qualified line-clearance arborists and qualified line-clearance arborist trainees performing line clearance in the aftermath of a storm or under similar conditions shall be trained in the special hazards associated with this type of work.

5.3.3 Line-clearance operations shall be suspended when storm work or emergency conditions develop involving energized electrical conductors. Electrical system owners/operators shall be notified immediately.

6 Vehicles and Mobile Equipment

6.1 Prior to daily use of vehicles, visual walk-around inspections and operational checks shall be made in accordance with the manufacturers' and owners' instructions.

6.1.1 Vehicles and other mobile equipment shall be equipped and maintained with all manufacturers' safety devices, instructions, warnings and safeguards. Arborists and other workers shall follow instructions provided by manufacturers.

6.1.2 Only qualified personnel who are properly licensed in accordance with Federal, state or local laws and regulations shall operate equipment.

6.1.3 Safety seatbelts, when provided by the manufacturer, shall be worn while a vehicle is in motion.

6.1.4 Equipment shall be turned off, keys removed and rotating parts at rest prior to making repairs or adjustments, except where manufacturers' procedures require otherwise. Defects or malfunctions affecting the safe operation of equipment shall be corrected before placing such equipment into use.

6.1.5 Vehicles with obscured rear vision, particularly those with towed equipment, should be backed up only when absolutely necessary and then should have outside, rear guidance, when available.

6.1.6 Material and equipment carried on vehicles shall be properly stored and secured to prevent movement.

6.1.7 Riding outside or on top of vehicles shall not be permitted, unless in an approved position required by the operation.

6.1.8 Hoisting or lifting equipment shall be used within rated capacities as stated by the manufacturers' specifications.

6.1.9 Manufacturers' instructions shall be followed in detecting hydraulic leaks. No part of the body shall be used to locate or stop hydraulic leaks.

6.1.10 Step surfaces and platforms on mobile equipment shall be skid-resistant.

6.1.11 Manufacturers' preventive maintenance inspections and parts replacement procedures should be followed.

6.1.12 Keys shall be removed from the ignition when vehicles or equipment are left unattended.

6.2 Aerial Devices

6.2.1 Aerial devices shall receive visual walk-around inspections and operational checks in accordance with the manufacturers' and owners' instructions prior to daily use. Manufacturers' instructions shall be available to the arborist.

6.2.2 Aerial devices shall be provided with a point of attachment to secure a full body harness with a shock-absorbing lanyard or body belt and lanyard. Fall protection shall be worn when working aloft.

6.2.3 Combined loads shall not exceed rated lift capacities. Load ratings shall be conspicuously and permanently posted on aerial devices in accordance with ANSI A92.2.

6.2.4 Aerial devices or aerial ladders shall not be used as cranes or hoists to lift or lower materials, unless specifically designed by the manufacturer to perform such operations.

6.2.5 Wheel chocks shall be set before using an aerial device, unless the device has no wheels on the ground or is designed for use without chocks.

6.2.6 Arborists and other workers shall ensure adequate clearance and give warning prior to lowering outriggers. Pads shall be set under outrigger feet when needed to ensure stable footing.

6.2.7 Arborists shall look in the direction of travel of the bucket and be aware of the location of the booms in relation to all other objects and hazards, when operating aerial devices.

6.2.8 Clearances from passing vehicles shall be maintained or traffic control shall be provided, when booms or buckets are operated over roads.

6.2.9 One-person buckets shall not have more than one person in them during arboricultural operations.

6.2.10 Hydraulic/pneumatic tools shall be disconnected when servicing or adjusting, except where manufacturers' procedures require otherwise.

6.2.11 To avoid flying particles or whipping hydraulic/pneumatic hoses, pressure shall be released before connections are broken except where quick-acting connectors are used. Hydraulic/pneumatic hoses shall never be kinked in order to cut off pressure.

6.2.12 No part of the body shall be used to locate or stop hydraulic leaks.

6.2.13 Hoses affecting dielectric characteristics of equipment shall meet manufacturers' requirements. Flash point of hydraulic fluid shall meet the minimum set by manufacturer.

6.2.14 Booms or buckets shall not make contact with energized electrical conductors, poles, trees or similar objects.

6.2.15 Electric cables (as used with electric saws, lights or other conductive material) shall not be run from the vehicle to the bucket, when working in proximity to energized electrical conductors.

6.2.16 Aerial devices shall not be moved with an arborist in an elevated bucket, except for equipment that is specifically designed for such operation. Booms of fully-articulated aerial devices shall not be considered elevated in a working position when the bucket is positioned just above the ground and directly in front of or behind the vehicle. Booms should be held as low as feasible so that the arborist's head is below the highest point of the vehicle.

6.2.17 Holes shall not be drilled in buckets or liners that would reduce dielectric integrity.

6.2.18 During aerial device operations, arborists and other workers not engaged in line clearance shall maintain a minimum approach distance of 10 feet (3.05 meters) from energized electrical conductors in accordance with Table 2. Qualified line-clearance arborists or qualified line-clearance arborist trainees using an insulated aerial bucket may operate in accordance with minimum approach distances provided in Table 1.

6.2.19 Arborists shall be instructed that insulated aerial buckets do not protect them from other electric paths to the ground, such as those through trees, guy wires or paths from one phase wire to the second phase wire, any one of which can be fatal.

6.3 Brush Chippers

6.3.1 Access panels for maintenance and adjustment including discharge chute and cutter housing shall be closed and secured prior to starting the engine of brush chippers.

6.3.2 Rotary drum or disc brush chippers not equipped with a mechanical infeed system shall be equipped with an infeed hopper not less than 85 inches (2.15 meters) measured from the blades or knives to ground level over the centerline of the hopper. Side members of the infeed hopper shall have sufficient height so as to prevent workers from contacting the blades or knives during operations.

6.3.3 Rotary drum or disc brush chippers not equipped with a mechanical infeed system shall have a flexible anti-kickback device installed in the infeed hopper to reduce the risk of injury from flying chips and debris.

6.3.4 Brush chippers equipped with a mechanical infeed system shall have a quick stop and reversing device on the infeed system. The activating mechanism for the quick stop and reversing device shall be located across the top, along each side, and close to the feed end of the infeed hopper within easy reach of the worker.

6.3.5 Arborists, workers and mechanics shall not, under any circumstances, reach into the infeed hopper when the cutter disc or rotary drum or feed rollers are moving.

6.3.6 Trailer chippers, when detached from the vehicles, shall be chocked or otherwise secured in place.

6.3.7 Vision, hearing and/or other appropriate personal protective equipment shall be worn when in the immediate area of a brush chipper in accordance with section 4.2.

6.3.8 When in a towing position, chipper safety chains shall be crossed under the tongue of the chipper and properly affixed to the towing vehicle.

6.3.9 Care should be taken to ensure that chipper exhaust systems do not present a fire hazard.

6.4 Sprayers and Related Equipment

6.4.1 Working and walking surfaces of all sprayers and related equipment shall be covered with skid-resistant material.

6.4.2 Equipment on which arborists stand and spray while the vehicle is in motion shall be equipped with guardrails around the working area. Guardrails shall be constructed in accordance with ANSI A1264.1.

6.5 Stump Cutters

6.5.1 Stump cutters shall be equipped with enclosures or guards that reduce the risk of injury during operation. Enclosures or guards shall be kept in place when stump cutters are operative.

6.5.2 Arborists and other workers in the immediate stump cutting area shall wear vision, hearing and/or other personal protective equipment in accordance with section 4.2.

6.5.3 When in a towing position, stump cutter safety chains shall be crossed under the tongue of the stump cutter and properly affixed to the towing vehicle.

6.5.4 Towable stump cutters or stump cutter trailers, when detached from the vehicle, shall be chocked or otherwise secured in place.

6.6 Trucks

6.6.1 A steel bulkhead or equivalent protective devices shall be provided to protect workers from load shifts in vehicles carrying logs or large limbs.

6.6.2 Logs and brush shall be securely loaded onto vehicles.

6.6.3 Logs and brush shall not overhang the sides or obscure taillights, brake lights and vision.

6.6.4 To avoid the hazard of spontaneous combustion or the production of undesirable odors, wood chips should not be left in vehicles for extended periods.

6.7 Log Loaders, Cranes and Related Hoists

6.7.1 Operators of hoisting equipment shall be trained and shall maintain a minimum approach distance of 10 feet (3.05 meters) from energized electrical conductors in accordance with Tables 1 and 2. Non-conductive load lines may be operated within minimum approach distances set forth in Tables 1 and 2.

6.7.2 Boom angle indicators shall be maintained on telescopic cranes, when provided by the manufacturer.

6.7.3 Operators of hoisting equipment shall remain at the controls while a load is suspended.

6.7.4 Wire ropes, gears, chain drives and other parts shall be inspected in accordance with applicable standards as well as the manufacturers' instructions and guidelines. Chokers, slings or other means of attachment shall be inspected before use.

6.7.5 Riding the load line of a crane while it is under load tension shall be prohibited, except for circumstances outlined in 6.7.7.

6.7.6 A qualified arborist may be hoisted into position utilizing the crane, provided that he/she is tied in with an arborist climbing line and arborist saddle and secured to a designated anchor point on the boom or line. The following procedures shall be followed when an arborist is to be lifted by a crane:

6.7.6.1 The person specifically responsible for the work shall authorize the use of a crane only when he/she has determined that it is the safest and most practical way to perform the work or gain access to the tree. Such authorization should be made in writing and be retained at the job site.

6.7.6.2 The crane operator shall be familiar with the potential hazards and operational techniques encountered in tree work.

6.7.6.3 The arborist climbing line shall be secured to the crane in such a way that it does not interfere with the function of any damage prevention or warning device on the crane, and so that no part of the crane compromises the climbing line or any other component of the climbing system.

6.7.6.4 The crane operator and the person responsible for the work to be performed shall meet prior to the work to review procedures to be followed. If the work involves a signal person and/or arborist being lifted in addition to the person responsible for the work, they shall participate in the review.

6.7.6.5 Communication between the crane operator and the arborist being lifted shall be maintained either directly or through the appointed signal person.

6.7.6.6 The crane shall be supported on a firm surface and maintained in a level position. The crane operator shall use blocking or other means if necessary so that the support medium does not exceed its load-bearing capabilities. When provided, outriggers shall be extended and properly set. Lifting of arborists shall not be permitted when the crane is supported solely on its tires.

6.7.6.7 The crane operator shall test the adequacy of footing prior to any lifting. A green log weight chart (in Annex E) should be available to the crew.

6.7.6.8 The lifting and supporting shall be made under controlled conditions and under the direction of the arborist or an appointed signal person.

6.7.6.9 The crane operator shall remain at the controls when the arborist is attached to the crane.

6.7.6.10 The crane boom and load line shall be moved in a slow, controlled, cautious manner with no sudden movements when the arborist is attached. The lifting or lowering speed shall not exceed 100 ft./min. (0.5 meters/sec.). The crane shall be operated so that lowering is power-controlled.

6.7.6.11 The crane carrier shall not travel at any time while the arborist is attached.

6.7.7 The arborist shall be detached from the crane any time it is under load tension.

EXCEPTION: The person specifically responsible for the work shall allow the arborist to remain attached to the crane only while it is under load when it is determined that all reasonably possible alternative methods are inaccessible and attachment to the subject tree would create a greater safety risk due to its hazardous condition. Possible alternative methods include, but are not limited to:

(1) securing to the tree and detaching from the crane before it comes under load;

(2) use of a second crane;

(3) use of an aerial lift device;

(4) use of an adjacent tree;

6.8 Off-Road Equipment and Tracked Vehicles

6.8.1 Off-road and tracked vehicles shall be operated in the proper gear and speed relative to the operating environment and the manufacturers' instructions and guidelines.

6.8.2 Towing equipment for brush hogs and similar implements should be equipped with a deadman control. The worker shall disengage the power source to the rotary or cutter head before dismounting when deadman controls are not available.

7 Portable Power Hand Tools

7.1 Portable Electric Power Tools

7.1.1 Corded electric power tools shall not be used in trees or aerial devices near energized electrical conductors where there is a possibility of power tools or supply cords contacting the conductor.

7.1.2 All corded portable electric power tools shall be:

(1) Equipped with three-wire cords having the ground wire permanently connected to the tool frame and a means for grounding the other end or;

(2) Double insulated and permanently labeled as "Double Insulated" or;

(3) Connected to power supplies by means of an isolating transformer, or other isolated power supply.

7.1.3 Extension cords shall be maintained in safe condition. Exposed metal sockets shall not be used.

7.1.4 Manufacturers' operating and safety instructions shall be followed unless modified by this Standard.

7.1.5 Arborists and other workers should:

(1) Prevent cords from becoming entangled, damaged or cut by blades and bits.

(2) Avoid laying extension cords in water.

(3) Support electrical power tools and supply cords by a tool lanyard, independent of the arborist, when used aloft.

7.2 Gasoline-Powered Chain Saws

7.2.1 Manufacturers' operating and safety instructions should be followed unless modified by this Standard.

7.2.2 When an arborist or other worker is working in a tree other than from an aerial device, chain saws weighing more than 15 pounds (6.8 kilograms) service weight shall be supported by a separate line or tool lanyard.

EXCEPTION: This requirement does not apply during removal operations where no supporting limb will be available.

7.2.3 Secure footing shall be maintained when starting the chain saw.

7.2.4 When being started, chain saws shall be held firmly in place on the ground or otherwise held in a manner that does not allow movement of the saw when pulling the starter handle. The chain brake shall be engaged on saws so equipped.

7.2.5 When an arborist or other worker is working from the bucket of an aerial lift device, drop-starting a chain saw is permissable only after ensuring that the area below is not occupied.

7.2.6 Chain saw engines shall be started and operated only when arborists and other workers are clear of the chain saw.

7.2.7 Chain saws shall be held with the thumbs and fingers of both hands encircling the handles during operation.

EXCEPTION: This requirement does not apply when an employer can demonstrate that a greater hazard is posed by keeping both hands on the chain saw in a particular situation. This exception should not apply to lightweight chain saws (under 15 pounds [6.8 kilograms]) when used in a tree.

7.2.8 Arborists shall use a second point of attachment (work-positioning lanyard or double-crotched rope) when operating a chain saw in a tree, unless the employer demonstrates that a greater hazard is posed by using a second point of attachment while operating chain saws in that particular situation.

7.2.9 Chain saw mufflers/spark arresters shall be maintained in good condition.

7.2.10 Chain saws should be cleaned periodically.

7.2.11 Because of the many specialized chain saw operations utilized during arboricultural operations, it must be emphasized that operational exceptions to provisions of ANSI B175 are acceptable and may require a flexible and/or applicability judgment decision for a prescribed operation.

7.3 Powered Pole Saws and Backpack Power Units

7.3.1 Manufacturers' operating instructions should be followed unless modified by this Standard.

7.3.2 Only workers operating the equipment shall be within 10 feet (3.05 meters) of the cutting head of a brush saw during operations.

7.3.3 Power units shall be equipped with a readily accessible quick shutoff switch.

7.3.4 Operators shall observe the position of all other workers in the vicinity while the equipment is running.

7.3.5 Engines shall be stopped for all cleaning, refueling, adjustments and repairs to the saw or engine, except where manufacturers' procedures require otherwise.

8 Hand Tools and Equipment

8.1 General

8.1.1 Correct hand tools and equipment shall be selected for the job.

8.1.2 Hand tools and equipment that have been made unsafe by damage or defect shall not be used.

8.1.3 Workers shall maintain a safe working distance from other workers when using hand tools and equipment.

8.1.4 When climbing into a tree, arborists shall not carry hand tools and equipment in their hands unless they are tools that are used to assist them in their climbing. Tools other than ropes or throwlines shall not be thrown into a tree, out of a tree or from arborist to arborist while in a tree.

8.1.5 Arborist climbing lines or handlines should be used for raising and lowering hand tools and equipment. Arborists should raise or lower hand tools and equipment in a manner such that the cutting edge will not contact the arborist climbing line or handline.

8.1.6 Hand tools and equipment shall be properly stored or placed in plain sight out of the immediate work area when not in use.

8.1.7 Tool handles shall be tight-fitting and wedged to prevent slippage down the handle.

8.2 Axes, Brush Hooks, Machetes and Other Chopping Tools

8.2.1 Chopping tools that have loose or cracked heads or splintered handles shall not be used.

8.2.2 Chopping tools should not be used while working aloft.

8.2.3 Chopping tools shall be swung away from the feet, legs and body, using the minimum forces practical for function and control.

8.2.4 Chopping tools shall not be driven as wedges or used to drive metal wedges.

8.2.5 A secure grip, firm footing and clearance of overhead hazards shall be maintained when swinging grub hoes, mattocks and picks.

8.3 Manual Pole Pruners and Pole Saws

8.3.1 Manual pole pruners, pole saws and other similar tools with poles made of metal or other conductive material shall not be used in line-clearance operations or in other operations where electrical hazards exist. For line-clearance operations, tools shall be equipped with wooden or non-metallic poles. The actuating cord shall be made of non-conducting material (for example, polypropylene).

8.4 Cant Hooks, Cant Dogs, Peaveys, Tongs and Carrying Bars

8.4.1 Hooks should be firmly set before applying force.

8.4.2 Tools with cracked, splintered or weakened handles should not be used.

8.4.3 Arborists and other workers shall be warned and in the clear before logs are moved.

8.4.4 Points of hooks shall be at least 2 inches (51 mm) long and kept sharp.

8.4.5 Arborists and other workers shall stand uphill when rolling logs downhill.

8.5 Wedges, Chisels and Gouges

8.5.1 Wedges, chisels and gouges shall be inspected for cracks and flaws before use.

8.5.2 Wedges and chisels shall be properly pointed and tempered. Tools with mushroomed heads shall not be used. Eye protection shall be used during impact operations.

8.5.3 Only wood, plastic or soft-metal wedges shall be used to prevent binding while operating chain saws.

8.5.4 Wood-handled chisels should be protected with a ferrule on the striking end.

8.6 Hammers, Mauls and Sledges

8.6.1 Wood, rubber or high-impact plastic mauls, sledges or hammers should be used when striking wood-handled chisels or gouges.

8.7 Ropes and Arborist Climbing Equipment

8.7.1 Type II saddle belts and lanyards as specified in ANSI A10.14 shall be worn when above ground level.

8.7.2 Arborist saddles and work-positioning lanyards shall not be altered in a manner that would compromise the integrity of the equipment.

8.7.3 Arborist climbing lines shall be identified by the manufacturer as suitable for tree climbing.

8.7.4 Prusik loops, split tails and work-positioning lanyards used in a climbing system shall meet the minimum strength standards for arborist climbing lines.

8.7.5 Carabiners used in securing the arborist climbing line and/or the work-positioning lanyard to the arborist climbing saddle shall be of the self-closing positive-locking type with a minimum tensile strength of 5,000 pounds. Standard one-quarter-turn, twistlock carabiners do not have a positive-locking mechanism and shall not be used.

8.7.6 Rope snaps used in climbing shall be the self-closing, locking type with a minimum tensile strength of 5,000 pounds.

8.7.7 Splicing shall be done in accordance with manufacturers' specifications.

8.7.8 Equipment used to secure an arborist in the tree or from an aerial lift shall not be used for anything other than its intended purpose.

EXCEPTION: The arborist climbing line may be used to raise and lower tools.

8.7.9 Rope ends shall be finished in a manner to prevent raveling.

8.7.10 Ropes and climbing equipment shall be stored and transported in such a manner to prevent damage through contact with sharp tools, cutting edges, gas, oil or chemicals.

8.7.11 Arborists shall inspect all components of their climbing system for damage, cuts, abrasion and/or deterioration before each use. Excessively worn or damaged components shall be removed from service.

8.7.12 Arborist climbing lines shall never be left in trees unattended.

8.8 Tackle Blocks and Pulleys

8.8.1 Tackle blocks and pulleys and their connecting links shall be inspected immediately before use and removed from service if found to be defective.

8.9 Ladders

8.9.1 Ladders made of metal or other conductive material shall not be used where electrical hazards exist. Only wooden ladders (constructed in accordance with ANSI A14.1) or non-conductive ladders made of synthetic material equal to or exceeding the strength of wooden ladders shall be used.

8.9.2 Metal ladders used where no electrical hazard exists shall conform to ANSI A14.2.

8.9.3 All ladders shall be inspected before use and removed from service if found defective.

8.9.4 Cleats, metal points, skid-resistant feet, lashing or other effective means of securing the ladder shall be used when there is danger of slipping.

8.9.5 Ladders shall be supported while in storage to prevent sagging. Except when on mobile equipment, ladders should be stored under suitable cover, protected from the weather, and kept in a dry location away from excessive heat.

8.9.6 Ladders shall not be used as bridges or inclined planes to load or handle logs or other material.

9 Work Procedures

9.1 Climbing

9.1.1 A visual hazard assessment including the root collar shall be performed prior to climbing, entering or performing any work in the tree.

9.1.2 Arborists shall be tied in or secured while ascending the tree and remain tied in or secured until the work is completed and they have returned to the ground.

EXCEPTION:

(1) While ascending a ladder to gain access to

a tree, however, arborists shall not work from or leave the ladder until they are tied in or secured.

(2) While ascending a tree where the density of branches growing from the stem prevents the arborist from crotching the arborist climbing line or work-positioning lanyard through the branches, then and only then, is the three-point climbing technique acceptable.

9.1.3 Arborists shall have available a minimum of two means of being secured while working aloft; for example, an arborist climbing line and a work-positioning lanyard.

9.1.4 A false crotch may be used at the discretion of the arborist in lieu of a natural crotch.

9.1.5 The tie-in position should be well above the work area so that the arborist will not be subjected to an uncontrolled pendulum swing in the event of a slip.

9.1.6 A figure-eight knot shall be tied in the end of the arborist climbing line to prevent pulling the rope through the climbing hitch, when working at heights greater than one-half the length of the arborist climbing line.

9.1.7 A second arborist or other worker trained in emergency procedures shall be within visual or voice communication during arboricultural operations above 12 feet (3.65 meters) that are not subject to the requirements of Section 5.2.3.

9.1.8 Arborists shall inspect climbing lines, work lines, lanyards, and other climbing equipment for damage, cuts, abrasion and/or deterioration before each use and shall remove it from service if signs of excessive wear or damage are found.

9.1.9 Hands and feet should be placed on separate limbs, if possible, maintaining three points of contact with the tree while climbing.

9.2 Pruning and Trimming

9.2.1 Pole pruners and pole saws, when hung, shall be securely positioned to prevent dislodgement. Pole pruners or pole saws shall not be hung on electrical conductors or left in a tree unattended. Pole saws and pole pruners shall be hung so that sharp edges are away from the arborist and shall be removed when the arborist leaves the tree.

9.2.2 Scabbards or sheaths, used to carry handsaws when not in use, shall be hooked to the arborist saddle. Folding saws, when not in use, shall be closed and hooked to the arborist saddle.

9.2.3 Communications shall be established between the arborists aloft and the arborists and other workers on the ground before cutting and dropping limbs. The command "stand clear" from aloft and response "all clear" from the ground are terms that may be used for this purpose. Prearranged hand signals may also be used. Arborists and other workers returning to the work area shall be acknowledged by arborists aloft.

9.2.4 A separate work line shall be attached to limbs that cannot be dropped safely or controlled by hand. Arborist climbing lines and work lines shall not be secured to the same crotch.

9.2.5 Cut branches shall not be left in trees upon completion of work.

9.2.6 Palm frond skirts that have three years or more of growth shall be removed from the top down. Arborists performing this work will be supported by an arborist climbing line and a false crotch. Arborists shall never attempt to remove skirts of three years or more by positioning themselves below work areas while being supported by a lanyard.

9.2.7 Dry conditions and dead fronds present an extreme fire hazard. When dry conditions exist, arborists and other workers shall not smoke while working in or near dead palm fronds. All chain saws used under such conditions shall have mufflers and spark arresters in good working condition.

9.3 Cabling

9.3.1 Arborists and other workers on the ground shall not stand under the work area of a tree when a cabling system is being installed.

9.3.2 Tools used for cabling, bark tracing and cavity work shall be carried in a bag, on a belt designed to hold such tools, or attached to a tool lanyard.

9.3.3 Arborists in trees should be positioned off to one side in order to avoid injury in case of cable system failure, such as when a block and tackle or a hand winch are released.

9.4 Lowering Limbs

9.4.1 Arborists performing lowering operations shall inspect trees to determine if the trees can withstand the strain of lowering procedures. If not, other means of lowering branches should be provided.

9.4.2 Arborists in the tree should be above or to the side of the limb being lowered when large limbs are lowered in sections.

9.4.3 Work lines shall be used when conditions warrant.

9.4.4 When large cuts are being made in single-spar trees, both ends of the work-positioning lanyard should be attached to a single point on the arborist saddle to prevent injury should the spar split. The same technique should be used when making large cuts on large horizontal limbs, which also might split. Hip or side D-rings of the arborist saddle should not be used for this purpose.

9.5 Tree Removal

9.5.1 Before beginning any tree removal operation, the chain saw operator and/or crew leader shall carefully consider the following conditions in the planning process to address tree and site factors and shall take appropriate actions to ensure a safe removal operation:

(1) Surrounding areas including other trees and the tree to be removed;

(2) Species and shape of the tree;

(3) Lean of the tree;

(4) Loose limbs, chunks or other overhead material;

(5) Wind force and direction;

(6) Decayed or weak spots throughout the tree (be aware of additional hazards if these conditions exist in the hinge area);

(7) Location and means to protect other persons, property and electrical conductors;

(8) Size and terrain characteristics or limitations of the work area.

(9) When it is necessary to shorten or remove branches before dropping the tree, the arborist shall attempt to determine if the tree can withstand the strain of the lowering procedures. If not, other means of removing the tree should be considered.

9.5.2 Climbing spurs shall have gaffs of the type and length that are compatible for the tree being climbed.

9.5.3 Work plans for removal operations shall be communicated to all crew members in a job briefing before commencing work.

9.5.4 Wedges, block and tackle, rope, wire cable (except where an electrical hazard exists) or other appropriate devices shall be used when there is a danger that the tree or trees being removed may fall in the wrong direction or damage property. All limbs shall be removed to a height and width sufficient to allow the tree to fall clear of any wires and other objects in the vicinity.

9.5.5 Workers shall be positioned and their duties organized so the actions of one worker will not create a hazard for any other worker.

9.5.6 Workers not directly involved in the removal operation shall be clear of the work area where practicable beyond the length of the tree unless a team of employees is necessary to remove a particular tree.

9.5.7 Workers returning to the work area shall not enter until the chain saw operator has acknowledged that it is safe to do so.

9.5.8 Crew leaders shall determine if one or more employees are necessary for tree removal operations.

9.5.9 Workers shall not approach mechanical tree removal or mechanical re-clearing operations, such as a rotary or flail mower, until the operator has acknowledged that it is safe to do so.

9.5.10 If the crew leader determines that one or more workers are necessary to manually take a tree down, a work plan shall be developed by the crew leader so that mechanical and manual operations do not conflict with each other, creating a safety hazard.

9.5.11 When a pull line is being used, workers not involved in removing a tree or trunk shall be clear by a minimum of one tree length, unless it is necessary to have a team of employees involved in the removal operation.

9.5.12 Workers not directly involved in manual land-clearing operations shall be at least two tree lengths away from the tree or trunk being dropped.

EXCEPTION: This requirement does not apply in the presence of site restrictions, such as waterways or cliffs. Other arborists and workers shall be beyond the trees' striking range and as close to twice the height as practicable.

9.5.13 A planned escape route for all workers shall be prepared before cutting any standing tree or trunk. The preferable escape route is 45 degrees on either side of a line drawn opposite the intended direction of the fall. Obstructions shall be cleared along the escape path. The chain saw operator shall use this path for egress once the cut has been completed.

9.5.14 Notches shall be used on all trees and trunks over 5 inches (12.5 cm) in diameter at breast height.

9.5.15 Notches and back cuts shall be made at a height above the highest ground level to enable chain saw operators to safely begin the cut, control the tree or trunk and have freedom of movement for escape.

9.5.15.1 The notch cut used shall be either a conventional, open-face or Humboldt.

9.5.15.2 Notches shall be 45 degrees or greater and large enough to guide the fall of trees and trunks to prevent splitting.

9.5.15.3 Notch depth should not exceed one-third of the diameter of the tree.

9.5.15.4 The back cut shall not penetrate into the predetermined hinge area.

9.5.16 With a conventional notch or Humboldt notch, the back cut shall be 1-2 inches (2.5-5 mm) above the apex of the notch to provide an adequate platform to prevent kickback of the tree or trunk. With an open-face notch (greater than 70 degrees), the back cut should be at the same level as the apex of the notch.

9.5.17 Before commencing the back cut, there shall be a command such as "stand clear" from the arborist operating the chain saw and a response such as "all clear" from the workers supporting the removal operation. Pre-arranged, two-way hand signals may also be used. Only designated persons shall give such signals. All workers in the vicinity shall be out of range when the tree or trunk falls. Visual contact should be maintained with the tree or trunk until it is on the ground.

9.5.18 Once the back cut has been completed, the chain saw operator shall immediately move a safe distance away from the tree or trunk on the planned escape route.

9.5.19 The two cuts that form the notch shall not cross at the point where they meet.

9.6 Brush Removal and Chipping

9.6.1 Brush and logs shall not be allowed to create hazards in the work areas.

9.6.2 Personal protective equipment shall be worn when in the immediate area of chipping operations in accordance with Sections 4.2.1 and 9.6.6.

9.6.3 Brush and logs shall be fed into chippers, butt or cut end first from the side of the feed table centerline, and the operator shall immediately turn away from the feed table when the brush is taken into the rotor or feed rollers. Chippers should be fed from the curbside whenever practical.

9.6.4 The brush chipper discharge chute or cutter housing cover shall not be raised or removed while any part of the chipper is turning or moving. Chippers shall not be used unless a discharge chute of sufficient length or design is provided that prevents personal contact with the blades. See Appendix C5, Control of Hazardous Energy (Informative).

9.6.5 Foreign material, such as stones, nails, sweepings, and rakings, shall not be fed into chippers.

9.6.6 Loose clothing, climbing equipment, body belts or gauntlet-type gloves (for example: long cuffed linemen or welder's gloves) shall not be worn while operating chippers.

9.6.7 Small branches shall be fed into chippers with longer branches or by utilizing a long stick for pushing.

9.6.8 Hands or other parts of the body shall not be placed into the infeed hopper. Leaning into or pushing material into infeed hoppers with feet is prohibited.

9.6.9 Training shall be provided in the proper operation, feeding, starting and shutdown procedures for the chipper being used.

9.6.10 Maintenance shall be performed only by those authorized by the employer and trained to perform such operations.

9.7 Limbing and Bucking

9.7.1 Chain saws should be operated away from the vicinity of the legs and feet. Employ natural barriers where possible, such as limbs between the saw and the body, while ensuring proper balance. While operating a chain saw, the preferred working position is on the uphill side of the work.

9.7.2 When necessary to prevent rolling, logs shall be blocked with wood or other suitable material.

9.7.3 Trees, segments of trees, limbs or saplings under stress or tension due to pressure or weight of another object shall be considered hazardous. Appropriate cutting techniques shall be followed.

9.7.4 Wedges should be used as necessary to prevent binding of the guide bar or chain when bucking up trunks of trees.

9.7.5 Cant hooks or peaveys should be used as an aid in rolling large or irregular logs to complete bucking.

9.7.6 When more than one arborist or other worker is limbing or bucking a tree, each shall be aware of the other's location and activity.

Annex A
(Informative)

Glossary of Additional Terms for ANSI Z133.1

NOTE – The numbers that appear in parentheses after these terms are cross-references to the section or subsection in the text in which the term is used.

aerial devices (6.2): Any one of the following types of vehicle-mounted apparatus used to elevate personnel to job sites above ground:

(1) Extensible boom platforms
(2) Aerial ladders
(3) Articulating boom platforms
(4) Vertical towers
(5) A combination of any of the above defined in ANSI A92.2.[3]

ascender (3.29): A mechanical device used for climbing rope.

back cut (9.5.15): The cut made in a tree limb or trunk on the side opposite the intended direction of fall.

brush hog (6.8.2): A heavy-duty rotary mower used for cutting and mulching brush, which is normally pulled by a farm-type tractor.

bucket (6.2.7): A basket-type enclosure approximately 4 feet (1.22 meters) high, which is attached to the end of the upper boom on an aerial device, providing a work platform for the operator who is working aloft.

bucking (9.7): The act of sawing tree, limbs, or both, into smaller sections once they are on the ground.

conventional notch (9.5.15.1): (Figure 1) A directional felling cut into the side of a tree, facing the intended direction of fall and consisting of a horizontal face cut and an angle cut above it, creating a notch of approximately 45 degrees.

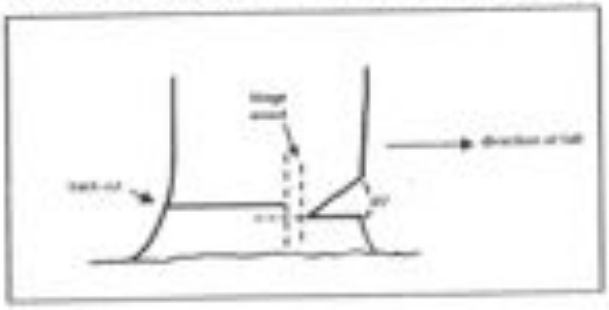

Figure 1

crotch (9.1.4): To pass a rope through the crotch of a limb, or false crotch, in such a way that the load will be supported by the main leader.

deadman control (6.8.2): A safety switch, electrical or mechanical, that deactivates the equipment's function when released by the operator.

dielectric (4.2.2): Non-conductive of electrical current.

false crotch for rigging: A pulley, block, sling, lashing, or metal ring affixed to a tree's leader or limb, through which a load line is passed, to lower or raise limbs or equipment.

footlock (3.29): To climb up a suspended rope by pulling with the hands and arms and pushing upward with the feet. The loose end of the rope is wrapped under the middle and over the top of one foot, and is locked in place with pressure from the other foot. A Prusik loop, fashioned with an acceptable friction hitch, shall be used by the climber when footlocking.

Humboldt notch (9.5.15.1): (Figure 2) A directional felling cut into the side of a tree, facing the intended direction of fall and consisting of a horizontal face cut and an angled cut below it, creating a notch of approximately 45 degrees. A Humboldt cut is usually reserved for larger trees on steep slopes.

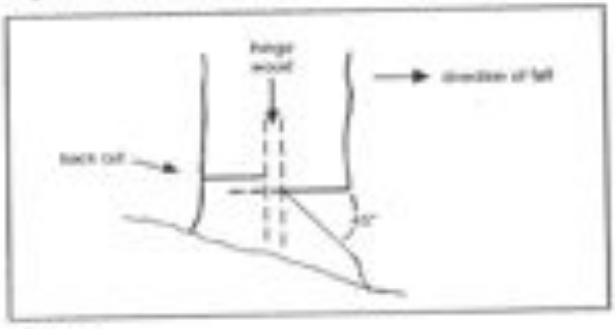

Figure 2

[3] The full titles for all referenced American National Standards are listed in section 2, Normative Reference, p.1, of this Standard.

kilovolts (5.2.12 (Table 1)): The term for 1,000 volts, abbreviated as kV. Higher voltages are generally expressed in this unit, i.e., 12.5 kV (12,500 volts) and 19.9 kV (19,900 volts).

mushroomed (8.5.2): A hazardous condition that develops from repeated hammering on the heads of the chisels and wedges that causes the metal to spread outward, fold under, and splinter off.

open-face notch (9.5.15.1): (Figure 3) A directional felling cut into the side of the tree, facing the intended direction of fall and consisting of two cuts creating a notch greater than 70 degrees.

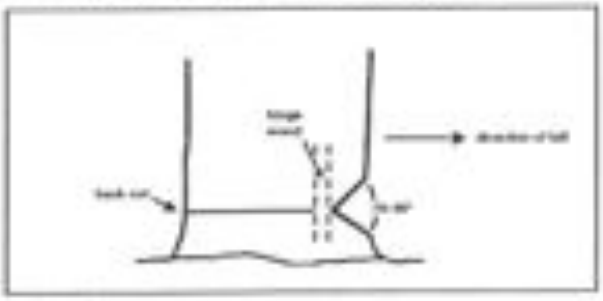

Figure 3

outrigger (6.2.6): Built-in device used to stabilize cranes, aerial devices and similar equipment.

phase (5.1.1 (4)): Any current-carrying conductor that has an electric potential other than ground.

phase-to-ground (Tables 1 and 2): The electric potential (voltage) between a conductor and ground (assumed at 0 volts).

phase-to-phase (5.1.1 (4)): The electrical potential (voltage) between two conductors, each having its own electric potential relative to ground.

primary conductor (5.2.3): Any conductor, including aluminum, copper, or aluminum conductor steel reinforced (ACSR), that is bare, covered or insulated, with a nominal voltage above 750 volts.

quick-acting connectors (6.2.11): Hose connectors in a hydraulic or pneumatic system designed to allow rapid connection or disconnection without leakage when the system is pressurized.

volts (5.2.3): A unit of electric potential difference between two points. Lower voltage systems are generally expressed in terms of volts, for example: 120 volts or 240 volts.

wheel chocks (6.2.5): Wedge-shaped blocks manufactured or employer approved to prevent unintentional movement of vehicle. Wheel chocks are placed in front of or in back of a vehicle's tires or tracks. If necessary, the chocks can be placed both in front and in back of the tires or tracks.

worklines (9.4.3): Ropes used for lifting, lowering or guiding limbs or equipment, or both, into or out of the tree.

ANNEX B
(Informative)

Recommended Guidelines for Standard Performance and SafetyTraining for Qualified Line-Clearance Arborists and Qualified Line-Clearance Arborist Trainees or Qualified Arborists and Qualified Arborists Trainees

NOTE – The content of this training outline is generic and may be customized to achieve equivalent levels of safe practice by substituting or, where deemed appropriate to the circumstances, omitting portions of this outline. Use or non-use of training aids that may be available shall not be evidence of non-compliance with this standard or annex.

B.1 GENERAL REQUIREMENTS

Specific training in the area of individual expertise and work required of a qualified line-clearance arborist or qualified arborist should be provided by the employer and documentation of training retained on file for the duration of employment.

B.1.1 Introduction and employer/employee responsibilities

B.1.2 Provide employee orientation to include:

- Job description appropriate to job assignment qualified line-clearance arborist or qualified arborist)
- Introduction to immediate supervisor and crew members
- Familiarization with appropriate personal protective clothing and equipment and its proper use and maintenance
- Familiarization with equipment
- Introduction to company policies, procedures and safe work practices
- Safe work practices as related to job assignments

B.1.3 Employees shall acknowledge in writing participation in employee orientation training.

B.1.4 Knowledge of line-clearance or tree care pruning techniques appropriate to job assignments.

B.1.4.1 Provide education and training in accordance with prevailing national standards for utility pruning. Refer to recommended resources in Annex D for further information.

B.1.4.2 Provide education and training in accordance with prevailing local, state or regional standards for utility pruning, as well as those specified by utility contracts.

B.1.5 Provide tree knowledge for line-clearance or tree care purposes appropriate to job assignments.

B.1.5.1 Provide education and training relative to predominant tree species within geographic area, such as identification, growth habits, structure and wood strength.

B.1.5.2 Provide education and training for recognition and evaluation of potentially hazardous conditions related to tree structure. Refer to recommended resources in Annex D.

B.2 GENERAL SAFETY

B.2.1 OSHA standards

Familiarize employees with the requirements of Federal and/or state OSHA standards as applicable to employee job assignments. Refer to recommended resources in Annex D.

B.2.2 American National Standards

Familiarize employees with the requirements in ANSI Z133.1 as applicable to employee job assignments. Refer to recommended resources in Annex D.

B.2.3 Public safety and traffic control

Provide education and training in the use of public safety and traffic control devices as applicable under Federal, state or local regulations.

B.2.4 Electrical hazards

Provide education and training in the recognition and avoidance of electrical hazards applicable to employee job assignments (line clearance or tree care). Refer to recommended resources in Annex D.

B.2.5 Emergency conditions

Provide education and training in the proper procedures for safely performing work in emergency conditions applicable to employee job assignments.

B.2.6 Job site briefings

Provide education and training in job-site specific hazards associated with the job, work procedures and practices involved, special precautions and personal protective clothing and equipment requirements as applicable to employee job assignments.

B.3 PERSONAL SAFETY

B.3.1 Personal protective equipment

Provide personal protective equipment as required for applicable job assignments and instruct employees in its proper use, fit, life and maintenance. Refer to recommended resources in Annex D.

B.3.2 Emergency response procedures

Furnish employees with appropriate information and training necessary to expedite a response to a work-site emergency such as first-aid, CPR and aerial rescue.

B.3.3 Back and other accidental injury prevention

Provide education and training in the techniques required to avoid back and other accidental injuries applicable to job assignments.

B.3.4 Poison plant/animal identification and avoidance

Provide education and training in the identification and the need to avoid contact with poison plants and instructions for treating insect stings/bites and snake bites.

B.4 EQUIPMENT SAFETY

B.4.1 Mobile equipment and aerial lifts

Provide education and training in the inspection, operation and maintenance of all vehicles and equipment. This would include equipment such as aerial lifts, brush chippers, stump grinders, log loaders, tree cranes, mowing equipment and pesticide application equipment. All equipment shall comply with applicable Federal and state regulations, local ordinances and manufacturers' operating instructions. Such training shall be appropriate to employee job assignments. Refer to Annex D for recommended resources.

B.4.2 Aerial equipment and electrical hazards

Provide education and training so affected employees understand the required and recommended procedures for operating aerial devices in proximity to electrical hazards. Such training shall be appropriate to employee job assignments. Refer to Annex D for recommended resources.

B.4.3 Chain saw, power tool and hand tool use and safety

Provide education and training in the safe use of chain saws, power tools and hand tools in accordance with manufacturers' instructions. Such training shall be appropriate to the employee job assignments. Refer to Annex D for recommended resources.

B.4.4 Climbing equipment

Provide education and training in the inspection, maintenance and storage of climbing equipment such as ropes, saddles, personnel lanyards, rope snaps, carabiners and climbers. Such training shall be appropriate to employee job assignments.

B.5 OPERATIONAL SAFETY

B.5.1 Climbing techniques

Provide education and training in climbing techniques as appropriate to the employee job assignments. Refer to Annex D for recommended resources.

B.5.2 Rigging and tree removal

Provide education and training appropriate to employee job assignments, such as knots and ropes, rigging techniques, tree strength and weight characteristics and potential electrical hazards. Refer to Annex D for recommended resources.

B.5.2.1 Provide education and training in the identification and removal of danger trees when required. Such training shall be consistent with the requirements of the system owner/operator and appropriate to employee job assignments. Refer to Annex D for recommended resources.

B.5.2.2 Provide education and training in the identification of hazard trees. Such training shall appropriate to employee job assignments. Refer to Annex D for recommended resources.

B.5.3 Hazard communications

Provide education and training necessary to comply with Federal or state regulations appropriate to employee job assignments.

B.5.4. Pesticide use

Provide education and training necessary to comply with Federal or state regulations appropriate to employee job assignments.

Annex C
(Informative)

General Safety Procedures That Apply to All Tree Work

C.1 Lifting

Before lifting any weight:

(a) be sure there is a clear travel path available if the weight is to be carried from one place to another;

(b) decide exactly how the object should be grasped to avoid sharp edges, slivers, splinters or other things that might cause injury;

(c) make a preliminary lift to be sure the load can be safely handled;

(d) place feet solidly on the walking surface;

(e) crouch as close to the load as possible with legs bent at an angle of about 90 degrees;

(f) lift with the legs, not the back, keeping the weight as close to the body as possible;

(h) use a second worker when necessary.

C.2 Log Handling

Logs should be handled by the use of skids and winch equipment; cutting logs into shorter lengths should be considered.

C.3 Direct Supervision

Direct supervision is when a qualified line-clearance arborist or a qualified arborist supervisor is physically present on the job site.

C.4 Federal Regulations for Noise Levels

The acceptable noise levels as established by the Occupational Safety and Health Administration (OSHA) may be obtained by consulting 29 CFR 1910.95 or by writing:

U.S. Department of Labor
OSHA - Noise Conservation Standards
200 Constitution Avenue NW
Washington, DC 20210

C.5 Control of Hazardous Energy

When a worker is doing mechanical work, there are safety precautions which must be taken to prevent accidental injury caused by moving and elevated parts or the release of stored energy, such as hydraulic pressure. Failure to do so could result in a serious, potentially maiming or fatal injury. Any worker performing maintenance/repair shall comply with the employer's procedures. Any piece of equipment being serviced or repaired shall not be started, energized or used by any worker.

The following is a sample procedure.

Sequence for securing equipment

(1) The authorized person shall notify the crew and/or affected employees that maintenance/repair is to be done and that such equipment must be shut down and secured.

(2) The authorized person shall refer to the manufacturer's manual for proper procedures (as needed).

(3) If equipment is in an operational mode, shut it down by normal procedures.

(4) Keyed ignition systems must be in working order. Keys shall be removed and pocketed by the foreman or mechanic. When there is no keyed ignition system, the battery cables or spark plug wires may be disconnected.

(5) Materials/parts that must be raised or disconnected and suspended shall be properly secured, such as with an appropriate sling or jackstand. Flywheels, such as chipper cutter heads, are to be blocked to prevent pinch points.

(6) Disengage the power take-off before servicing/repairing, such as with hose replacement. Disconnect all hydraulic tools before adjusting or servicing. Do not attempt to stop a hydraulic leak with your body.

(7) Rotating parts, such as chipper blades, shall be stopped before maintenance/repair.

(8) Ensure that equipment is isolated and will not operate before proceeding with maintenance/repair.

(9) When the engine must be running for tuning or adjustment, special care must be given to moving parts.

Restoring equipment to service

When maintenance/repair is complete and equipment is ready to return to normal operation, the following steps shall be taken.

(1) Check for loose parts or tools that may have been left in the immediate area to prevent accidental contact with moving or electrical components when the equipment is engaged.

(2) Ensure that all guards are in place and employees are in the clear.

(3) Confirm that controls are in neutral.

(4) Reconnect key, cable or plug wires.

(5) Notify affected employees that equipment is ready to return to service.

The specific Control of Hazardous Energy requirements established by the Occupational Safety and Health Administration (OSHA) may be obtained by consulting 29 CFR 1910.147 or by writing: Department of Labor, OSHA, 200 Constitution Ave. NW, Washington, DC 20210.

Annex D
(Informative)

Available Resources

D.1 Applicable American National Standards

- Z133.1, *Arboricultural operations, safety*
- A300, *Standard practices for trees, shrubs and other woody plant maintenance (publication pending)*
- A10.14, *Requirements for safety belts, harnesses, lanyards, lifelines, and drop lines for construction and industrial use*
- A14.1, *Ladders – Portable wood – Safety requirements*
- A14.2, *Ladders – Portable metal – Safety requirements*
- A14.5, *Stepladder and platform ladders, aluminum magnesium, fiberglass ladders*
- A92.2, *Vehicle-mounted elevating and rotating aerial devices*
- Z359.1, *Safety requirements for personal fall arrest systems, subsystems, and components*
- B175.1, *Gasoline-powered chain saws, Safety requirements*
- Z87.1, *Practice for occupational and educational eye and face protection*
- Z89.1 *Personnel protection – Protective headgear for industrial workers – Requirements*

D.2 Applicable Federal Regulations[4]

- US Department of Labor – Occupational Safety and Health Administration:
  - 29 CFR 1910.000, *General Industry*
  - 29 CFR 1910.67, *Vehicle-mounted elevating and rotating work platforms*
  - 29 CFR 1910.95, *Occupational noise exposure*
  - 29 CFR 1910.132-136, *Personal protective equipment*
  - 29 CFR 1910.151, *Medical services and first aid*
  - 29 CFR 1910.268, *Telecommunication*
  - 29 CFR 1910.269, *Electric power generation, transmission, and distribution*
  - 29 CFR 1910.331-335, *Safety – Electric-related work practices*
  - 29 CFR 1910.1200, *Hazard communication*
  - *49 CFR, Transportation*

D.3 Training Programs Available from the National Arborist Association[5]

- Video programs:
  - *Electrical hazards and trees*
  - *Aerial rescue*
  - *Rigging for removal*
  - *Basic training for tree climbers*
  - *Principles of pruning*
  - *Pruning standards*
  - *Chipper use & safety*
  - *Back injury prevention program*
  - *Chain saw selection & maintenance*
  - *Chain saw use & safety*
  - *Ropes, knots and climbing*
  - *Basic training for ground operations in tree care(ISA/NAA)*
  - *Basic training for tree climbers (ISA/NAA)*
- Written programs:
  - *Home Study Program in Arboriculture – Series I & II*
  - *Crewleader home study program*
  - *Tailgate safety*
  - *Electrical hazards awareness program*
- Other publications:
  - *The treeworker*
  - *Climber's Guide to Tree Hazards (manual & decals)*

[4] All available from the U.S. Department of Labor, OSHA, 200 Constitution Avenue, NW, Washington, DC 20201.

[5] All available from National Arborist Association, 3 Perimeter Road, Unit 1, Manchester, NH 03103.

- *Pocket guide: Preventing falls*
- *Pocket guide: Preventing electrocutions*
- *Pocket guide: Preventing struck-by accidents*
- *Pocket guide: Tree felling guidelines*

D.4 Publications Available from the International Society of Arboriculture[6]

- Video programs:
  - *ArborMaster Series I:*
    - *Introduction to Climbing Techniques and Equipment*
    - *Introduction to Secured Footlock: Equipment and Techniques*
    - *Introduction to Ropes: Care, Construction and Limitations*
    - *Introduction to Belay: Equipment and Techniques*
    - *Introduction to Throwline: Equipment and Techniques*
    - *Climbing Knots and Hitches*
  - *ArborMaster Series II:*
    - *Innovations in Climbing Equipment;*
    - *Rigging Knots, Rope Slings, and Eye Splices.*
  - *ArborMaster Series III:*
    - *Chain Saw Safety*
    - *Chain Saw Maintenance*
    - *Notches, Hinges, and Backcuts*
    - *Felling Techniques*
    - *Limbing and Bucking*
    - *Chain Saw Use in Trees*
  - Other videos:
    - *Basic Training for Tree Climbers (ISA/NAA)*
    - *Basic Training for Ground Operations in Tree Care (ISA/NAA)*
    - *Climbing Skills Test Preparation*
    - *Conducting a Tree Climbing Jamboree*
    - *Utility Pruning: A Video Guide for Pruning Near Utility Conductors*
    - *Managing Trees for Public Safety: An Arborist's Guide*
    - *Tree Health Management: Evaluating Trees for Hazard*
- Written programs:
  - *Arborists' Certification Study Guide (English, Spanish and audio cassette)*
  - *Tree Climbers' Guide*
  - *Arborist Equipment: A Guide to the Tools and Equipment of Tree Maintenance and Removal*
  - *A Handbook of Hazard Tree Evaluation For Utility Arborists*
  - *Trees and Overhead Electric Wires: Proper Pruning & Selection*
  - *A Photographic Guide to the Evaluation of Hazard Trees in Urban Areas*
  - *Tree Pruning Guidelines (English and Spanish)*
- Other publications:
  - *Spanish-English/English-Spanish Dictionary of Arboricultural Terms*
  - *Tree Climber's Companion (written and published by Jeff Jepson)*
  - *On Rope (written by Smith and Padgett, published by National Speleological Society)*

D.5 Other Resources

- *ACRT Line-Clearance Tree Trimmer Certification Manual, Revision 1996*[7]
- *ACRT Electric Hazard Recognition Certification Manual*[7]
- *ACRT Electric Hazard Recognition for Substation Grounds Maintenance Personnel and Herbicide Applicators Certification Manual*[7]
- *US Department of Agriculture - US Forest Service Job Corps Urban Forestry Student Activity Guide*[7]
- *ACRT Working in Trees – Self Study Program*[7]
- *Pruning Trees Near Electric Utility Lines*[8]

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[6] All available from the International Society of Arboriculture, P.O. Box 3129, Champaign, IL 61826-3129 (www.isa-arbor.com)

[7] Available from ACRT, Inc., Utility Forestry Specialist, P.O. Box 401, 2545 Bailey Road, Cuyahoga Falls, OH 44221-0401, (800) 622-2582, www.acrtinc.com

[8] Published by Shigo and Trees Associates, 4 Denbow Road, Durham, NH 03824, (603) 868-7459

- *ArborMaster® Training, Inc. – 2-Day Training Modules*[h]
  - *Climbing Skills*
  - *Precision Felling, Chainsaw Safety & Maintenance*
  - *Level I Rigging*
  - *Level II Rigging*
  - *Ground Worker Skills & Aerial Support*
  - *Pruning, Cabling and Bracing*
  - *Emergency Response/Aerial Rescue*
  - *Tree Dynamics & Structural Risk Assessment*
  - *Bucket Truck Rigging*

Customized workshops and seminars also available)

- *M. F. Blair Institute of Arboriculture – Custom-designed seminars and training in arborist skills*[hh]
  - *Z133.1 compliance*
  - *A300 compliance*
  - *Basic rigging*
  - *Technical rigging*
  - *Hazard tree evaluation*
  - *Accident prevention/aerial rescue*
  - *Tree access and climbing techniques*
  - *Quality, safety and production in residential/commercial arboriculture*

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[h] Available from ArborMaster Training, Inc., 4 Marco Road, Willington, CT 06279, (860) 429-5028

[hh] Available from M.F. Blair Institute of Arboriculture, P.O. Box 292, Big Pool, MD 21711, (301) 842-2544