(The information contained in the following Annexes will not be part of this American National Standard (ANS) and will not be processed in accordance with ANSI's requirements for an ANS. As such, these Annexes may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the standard. Any comments submitted that relate to these Annexes will be reviewed by ISA but may not be brought to the Z133 Committee and will not receive a committee response).

Annex A: Glossary of Terms (Informative)

A.1 List of Terms

Note: The numbers in parentheses after these terms are cross-references to the section in the standard where the term is first used in a substantive context. See index for other uses of these terms in the standard.

aerial device (4.1.10): Any one of the following types of vehicle-mounted apparatus used to elevate personnel to work positions aloft:

- extensible boom platform
- aerial ladder
- articulating boom platform
- vertical tower
- a combination of any of the above, as defined in ANSI A92.2.

apex (9.4.13[6]): The point at which two saw cuts meet to form a notch.

applicator (5.6.3.3): A qualified person engaged in the application of materials such as, but not limited to, pesticides, growth regulators, and fertilizers.

approved (3.6.4): Acceptable to the federal, state, or local jurisdiction having enforcement authority.

approved container (3.6.2): Container having a spring-closing lid and spout cover designed to safely relieve internal pressure when subjected to fire exposure.

arboriculture (1.1): The art, science, technology, and business of utility, commercial, and municipal tree care.

arborist (1.2): A person who, through related training, on-the-job experience, or both; is familiar with the techniques and hazards involved in their assigned task within arboricultural operations, as explained in Section 1.1, Scope.

arborist climbing line (5.6.6.11): A rope designated to support the climber while aloft in a tree or attached to a crane, constructed according to specifications outlined in Section 8.2.4 and Section 8.2.5.

arborist saddle (5.6.6.11): A body-holding device with a belt that fastens around the waist connected to a seat strap; used by arborists in conjunction with other components for work positioning and suspension in trees (i.e., tree saddle, sit harness).

arborist trainee (3.4.7): An individual undergoing on-the-job training under the direct supervision of a qualified arborist. In the course of such training, the trainee becomes familiar with the hazards and equipment involved in arboricultural operations and demonstrates ability in the performance of the special techniques involved.

artificial anchorage point (false crotch) (8.2.6): A system, other than a natural branch union, used to support an arborist climbing line.

articulating crane (5.6.6): An apparatus whose boom consists of a series of folding, pin connected structural members, typically manipulated to extend or retract by power from hydraulic cylinders, intended for lifting material at considerable height and/or distance from the unit. Equipment whose intended purpose is to transfer material between ground and vehicle, or trailer, are exempt from this classification.

authorized (3.4.11.1): Designated by the entity that has care, custody, and control of the unit.

authorized person (5.6.2.6): A person approved or assigned by the employer to perform a specific type of duty or duties or to be at a specific location or locations at the work site.

back cut (9.4.13): The cut made in a tree limb or trunk on the side opposite the intended direction of fall.

backstay (9.2.9): A rope or cable that is set to share the load on a spar, limb, jib, pole, or other loadbearing member.

barber chair (9.4.14): Dangerous condition created when a tree or branch splits upward vertically from the back cut (a.k.a. slab up).

blind pick (5.6.6.13): A work situation where the qualified arborist or the load is not in full view of the qualified crane operator.

boom-supported elevating work platform (5.6.1.39): A self-propelled, integral-chassis aerial platform that can be positioned completely beyond the base and used to position personnel, along with their necessary tools and materials, at work locations. Aerial platforms are power-operated, and primary functions, including drive, are controlled from the platform. Such aerial platforms are intended to be occupied when driven.

bucket (5.6.1.12): see platform.

bucking (9.5.1): The act of sawing trees, limbs, or both, into smaller sections once they are on the ground.

cant hook (7.2): A long-handled lever fixed with a blunt metal end to handle logs; includes a swinging, metal hook opposing the blunt end to create leverage.

carabiner (5.6.1.11.2): A connector generally composed of a trapezoidal or oval-shaped body with a closed gate or similar arrangement that may be opened to receive an object and, when released, automatically closes to retain the object.

chopping tool (7.4.2): A wooden-, fiberglass-, or steel-handled tool with a sharp, single- or doubleedged steel head or blade mounted to it that is used to cut or split wood (for example, an axe or machete).

climbing hitch (8.2.19): 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, the tautline hitch, Blake's hitch, and the Prusik hitch.

communication lines (4.1.2[c]): *definition in progress*

compatible [equipment] (5.6.5.12): Consistently capable of performing to specification when combined in specific arrangements.

competency (3.7.1): Having the knowledge and skill with the demonstrated ability to perform specific tasks safely, as determined by the employer.

conductive (4.1.2[d]): Capable of carrying an electrical current for the voltage likely to be present.

contract employer (4.5.4): An employer, other than a host employer, that performs work covered by 29 CFR 1910.269 under contract with an electrical system owner/operator.



conventional notch (9.4.13[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 angle cut above it, creating a notch of approximately 45 degrees (see drawing).

crew leader (9.4.1): The qualified arborist designated as the individual in charge of a specific job or group of workers.

crotch (8.2.16): (n.) Branch union; the angle formed by two branches in the tree. (v.) To place a line through a branch union.

DBH (9.4.7): See diameter at breast height. Also called DSH.

deadman control (5.3.2): An electrical or mechanical safety switch that deactivates the equipment's function when released by the operator.

deenergized (4.2.5): Freed from any electrical connection to a source of potential difference and from electric charge; not having a potential different from that of the earth.

diameter at breast height (DBH) (9.4.7): Diameter of a tree measured at 4.5 ft (1.3 m) above ground. Also called diameter at standard height (DSH).

dielectric (4.1.15): Nonconductive of electrical current.

digging (3.4.12): Any man-made cut, cavity, trench, or depression in the earth's surface formed by earth removal for arboricultural operations, including, but not limited to, tree planting, stump grinding, or trenching.

direct contact (4.1.2[b]): Contact between any part of the body and an energized electric supply line or other energized electrical fixture or apparatus.

direct supervision (3.4.8): Oversight by a qualified arborist or a qualified arborist supervisor who is physically present on the jobsite.

drop-starting (6.4.3): 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.

drop zone (3.4.11): Area beneath workers aloft involved in arboricultural operations where the potential exists for struck-by injuries from falling objects.

dunnage (5.1.11): Wood or other material used to support equipment or a component (outrigger) and distribute loads to the ground. Also called cribbing or blocking.

electrical hazard (3.4.4): An object or situation that poses risk of injury or death due to direct or indirect contact with an electrical conductor. (Where unguarded, energized electrical conductors are present, specific minimum approach distances based on the arborist's or worker's level of training, as set forth in this standard, shall be followed.)

Electrical Level 1 Arborist – Unqualified for Any Voltages (4.2.2): An individual or trainee who has undergone essential training to develop an awareness of electrical hazards before engaging in tasks involving such hazards. However, they have not yet completed the necessary training or demonstrated proficiency in the requisite skills and techniques to qualify for higher levels of specialization within the field. These higher levels include Electrical Level 2 Arborist - Low Voltage, Electrical Level 3 Arborist - Primary Voltage, and Electrical Level 4 Arborist - Line Clearance.

Electrical Level 2 Arborist – Qualified for Voltages of 750 V or Less (4.3.2): An arborist who undertakes tree work in the presence of electrical hazards, excluding work carried out on behalf of utility companies for the purpose of clearing space around electric supply lines. This level of arborist possesses the necessary training, practical experience, and knowledge of equipment and hazards associated with incidental line clearance. They have also demonstrated the proficiency to implement hazard mitigation techniques specific to low voltage situations. The Electrical Level 2 Arborist is capable and qualified to perform arboricultural operations within a proximity of 10 ft (3 m) from power sources of 750 V or less while adhering to the distances specified in Table 2. However, they must not bring their body or any conductive material closer than 10 feet (3 meters) to primary electric supply lines exceeding 750 V. In cases where OSHA state plan regulations specify maximum low voltage thresholds other than 750 V, those regulations shall be followed.

Electrical Level 3 Arborist – Qualified for Voltages Up to 35 kV (4.4.2): An arborist who carries out tree work in the presence of electrical hazards, excluding tasks related to clearing space around electric supply lines on behalf of utility companies. This level of arborist possesses the necessary training, practical experience, and understanding of equipment and hazards associated with incidental line clearance. They have also demonstrated proficiency in executing the specialized techniques required for working with primary voltages. The Electrical Level 3 Arborist is trained and competent to conduct arboricultural operations within a proximity of 10 ft (3 m) from power sources up to 35 kV while adhering to the distances specified in Table 3. However, they must not bring their body or any conductive material closer than 10 ft (3 m) to primary electric supply lines exceeding 35 kV. Additionally, the Electrical Level 3 Arborist may enter a tree and perform work within it, while maintaining the same 10 ft (3 m) distance from primary electric supply lines exceeding 35 kV.

Electrical Level 4 Arborist – Qualified for All Voltages (4.5.2): An experienced professional in the field of arboriculture who specializes in line-clearance operations. This level of arborist has obtained the necessary expertise through comprehensive training and practical experience, acquiring in-depth knowledge of the equipment and hazards involved in line clearance activities. They have also demonstrated a high level of proficiency in executing the specialized techniques required for these tasks. The Electrical Level 4 Arborist is employed by the host employer and is responsible for conducting arboricultural operations within the specific context of line clearance work. Also known as qualified line-clearance arborist.

electrical system owner/operator (4.1.3): An organization that operates or controls the transmission and/or distribution of electric power through electrical conductors.

electric shock (4.1.2[f]): The physiological response of the human body due to electrical contact.

electric supply line (4.1.2[b]): Conductor used to transmit electric energy and their necessary supporting or containing structures (CFR 1910.269(x)).

electrocution (4.1.2[f]): Death by electrical contact.

employer (1.3): A person or entity engaged in a business or work activity who has employees working at their direction or the direction of a designated representative of this person or entity.

equipment, mobile (5.1.2): See mobile equipment.

frond (11.2): Large, divided leaf structures found in palms.

good working condition (7.1.4): A term describing a piece of equipment that has no mechanical defects, has all guards in place, and is operational as intended by the manufacturer.

grounded (4.1.2[d]): Describing an electrical system or device that is directly connected to the earth in an attempt to redirect electrical current to help mitigate the risk of electrical shocks or equipment damage.

handline (7.1.7): Rope designated as a tool to leverage, lift, and hold tools, equipment, wood, or other objects.

hinge (9.4.13): Strip of uncut wood fibers created between the face cut or notch and the back cut that helps control direction in tree felling or limb removal. Also called holding wood.

hitch cord (8.1.6): Separate, short length of rope with two eye terminations used to tie the climbing hitch in a climbing system with two points of attachment (double cord) and employed in a system to create friction.

host employer [line clearance] (4.5.11): An employer that operates or controls the operating procedures for an electric power generation, transmission, or distribution installation on which a contract employer is performing work covered by Section 4.5, Electrical Level 4 Arborist – Line Clearance. See also *electrical system owner/operator*.



Humboldt notch (9.4.13[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° (see drawing); usually reserved for larger trees on steep slopes.

indirect contact (4.1.2[b]): Contact between any part of the body and any conductive object in contact with an energized electric supply line. (Indirect contact can be made through conductive objects [e.g., conductive tools, tree branches, trucks, equipment, another human body] or as a result of communication wires, cables, fences, or guy wires becoming energized.)

insulated (4.1.10): Resistant to the flow of electricity at the voltage for which it is rated.

inverted root cone (11.4.2): A condition resulting in the narrowing of the palm trunk (V-shaped) at the root zone.

job briefing (3.4.1): 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.

job site (3.4.3): see work site.

kilovolt (kV) (Table 1): The term for 1,000 volts (V), abbreviated as kV. Higher voltages are generally given as kilovolts. Example: 12.5 kV (12,500 V) and 19.9 kV (19,900 V).

kilonewton (kN) (5.6.1.11.2): The measurement of force, abbreviated as kN. Equal to 224.8 pounds. Example: 24.02 kN equals 5,400 pounds.

ladder (4.1.9): A two-, three-, or four-legged structure that utilizes vertical side legs with cross sections uniformly placed between the side legs to be used as steps; available in wood, aluminum, or fiberglass; used to ascend to and descend from a height. Also see *tripod/orchard ladder*.

lanyard

tool lanyard (9.3.4): Short line or strap used to secure a tool while working aloft.

work-positioning lanyard (8.1.5): A component of a climbing system used for work positioning and consisting of a flexible line of rope or a strap that may incorporate a knot or mechanical device to allow for adjustability.

leg protection (3.3.8): Personal protective equipment intended to reduce the risk of injury to the legs during chain saw operations.

limbing (9.5.1): See bucking.

line clearance (4.5.2): The pruning, trimming, repairing, maintaining, removing, treating, or clearing of trees or the cutting of brush (vegetation management) that is within the minimum approach distance (MAD) per Table 4 of electric supply lines and equipment; vegetation management work performed by qualified line-clearance arborists or qualified line-clearance arborist trainees for the construction or maintenance of electric supply lines and/or the electric utility right-of-way corridor [only applicable when performed on behalf an organization that operates, or controls the operating procedures for, those electric lines or equipment].

load radius (5.6.6.11.8): The horizontal distance from the axis of rotation of the crane to the center of the vertical load rope or tackle with a load applied.

machinery (5.1.2): Wheeled/tracked units designed to be operated and/or driven off road by an operator on or within the unit. Mobile equipment is driven off road and, at times, on roadways, sometimes escorted, and does not require DMV or BMV licensing.

MAD (4.1.2[a]): See minimum approach distance (MAD).

manual tree felling (9.4.4): The removal of a tree or tree trunk by an arborist from the ground by the incorporation of a notch and back cut.

maul (7.3.7): A heavy hammer, sometimes made with a single edge; used to drive wedges or split wood.

minimum approach distance (MAD) (4.1.2[a]): The closest distance an employee may approach or bring any conductive object to an energized or a utility system grounded object; or the closest distance the employee may be to an energized or utility system grounded object, as outlined in Tables 1, 2, 3, and 4 of this standard.

mitigate (4.5.18): To lessen or make less severe a hazardous condition or dangerous situation.

mobile equipment (5.1.2): Wheeled/tracked units designed to be operated and/or driven off road by an operator on or within the unit. Mobile equipment is driven off road and, at times, on roadways, sometimes escorted, and doesn't require (DMV or BMV) licensing.

motor vehicle (5.1.2): A vehicle, such as a car or truck, licensed and tagged by the appropriate regulatory authority to be driven on or within roadways and used to transport people and/or goods.

open-face notch (9.4.13[2]): A directional felling cut into the side of the tree facing the intended direction of fall and consisting of two cuts that create a notch greater than 70° (see drawing).



operator (4.1.11): A person who:

- has demonstrated proficiency to use the type and capacity of equipment specified;
- is familiar with the equipment and hazards involved with arboriculture operations and has demonstrated proficiency in performing the special techniques involved; and
- where applicable, meets federal, state, or local requirements for licensure or training.

outrigger (5.6.1.9): Built-in device used to stabilize cranes, aerial devices, and similar equipment.

palm frond skirt (11.4): An accumulation of dead or dying fronds gathered down the stem of a palm.

personal protective equipment hazard assessment certification (3.3.2): Documentation of the employer's workplace hazard assessment that identifies the workplace evaluated; the person certifying that the evaluation has been performed; the date(s) of the hazard assessment; and, which identifies the document as a certification of hazard assessment.

pesticide (5.6.3.11): A substance used to manage unwanted plants, insects, or animals.

phase-to-ground (Table 1): The electric potential (voltage) between a conductor and ground.

phase-to-phase (Table 1): The electrical potential (voltage) between two conductors, each having its own electric potential relative to ground.

platform (4.1.10): The personnel-carrying component of an aerial device, such as a bucket, basket, stand, or equivalent.

power tool (6.1.3): Hand-held tool that has a power source (i.e., battery, electric, liquid fuel, hydraulic, pneumatic).

primary suspension point (PSP) (8.2.9): The rope anchor point in the tree that experiences the highest loads during the climb. Also known as primary support point. For an MRS climber, this is called the tie-in point (see *tied in*).

proficiency (TBD): definition in progress

proximity (3.3.4): An area within 10 ft (3.05 m) of energized overhead electrical conductors rated 50 kV phase-to-phase or less. For overhead electrical conductors rated more than 50 kV phase-to-phase, the distance is increased by 4 in (10.16 cm) for each additional 10 kV.

Prusik loop (8.1.6): Loop of rope used to form a Prusik hitch for climbing or rigging.

qualified line-clearance arborist (4.5.15): See Electrical Level 4 Arborist.

quick-acting connector (5.6.1.27): Hose connectors in a hydraulic or pneumatic system designed to allow rapid connection or disconnection without leakage when the system is pressurized.

radiofrequency (4.1.18): A frequency or band of frequencies in the range 104 to 1011 or 1012 Hz suitable for use in telecommunications.

recoil area (5.6.5.3): definition in progress

root boss (11.4): A conspicuously large root mass on a palm trunk.

saddle, arborist (5.6.6.11): See arborist saddle.

safety related (3.1.3): *definition in progress*

safety-sensitive task (3.7.1): A task that if performed incorrectly could cause injury, damage property, or disrupt activities.**secondary suspension point (SSP)** (8.2.12): Any additional point in the tree that shares some of the load with the primary suspension point during the climb. Also known as secondary support point.

secured

[aerial lift operator] (5.6.1.21): Protected from a fall from an aerial lift by use of a fall-arrest system.

[climber] (6.4.5): Safeguarded from unintended movement by 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, being tied in, using a work-positioning lanyard, being on belay, and ascending the arborist climbing line using the footlock technique while utilizing a Prusik loop or ascenders.

[object] (5.1.9.3): Made firm or tight; fastened.

shall (1.4): As used in this standard, denotes a mandatory requirement.

shock-loading (5.6.6.8.1): The force exerted by a falling or moving object on the structure supporting it, which is greater than the weight of the object. Also called dynamic load.

should (3.1.4): As used in this standard, denotes an advisory recommendation.

sloughing (11.4): Natural shedding or removal of dead tissue on palms.

snap hook (5.6.1.11.2): Locking type with a self-closing, self-locking gate that remains closed and locked until intentionally opened by the user for connection or disconnection. Also called self-locking or double-locking rope snap.

spar (8.2.16): A standing trunk or main stem of a tree without a crown and lateral limbs.

split-tail (8.1.6): Separate, short length of rope used to tie the climbing hitch in a climbing system with one point of attachment (single cord) and employed in a system to create friction.

spotter

[aerial lift operations] (5.6.1.33): A qualified person within voice and/or visual communication of the operator of an aerial lift and located in a position to view the boom while it is aloft in

order to help ensure clearances from obstacles and hazards (e.g., overhead energized lines, traffic, trees, other structures).

[crane] (5.6.6.3): A qualified person within voice and/or visual communication of the operator of a crane and located in a position to view the boom, load line, and load in order to help ensure clearances from obstacles and hazards (e.g., overhead energized lines, traffic, trees, or other structures).

[driving] (5.1.7): A person within voice and/or visual communication of the driver and located in a position to view the area in which the vehicle (unit) is moving to help ensure that the operation is and will remain safe.

step potential (4.1.2[f]): The voltage between the feet of a person standing near an energized grounded object. It is equal to the difference in voltage, given by the voltage distribution curve, between two points at different distances from the electrode. (A person could be at risk of injury during a fault simply by standing near the grounding point.)

suspended [load] (5.6.6.7): Any attached load held off the ground and against the force of gravity by the crane.

suspension point (8.2.13): A branch union or artificial anchor point that bears some or all of the load of the climber. See *primary suspension point* and *secondary suspension point*.

suspension system (8.1.1.1): definition in progress

tagline (TBD): Rope used during the removal of limbs or other portions of trees, or whole trees during tree removal operations. The line is used to introduce force to influence the direction of fall of the piece being cut. In pruning and rigging operations, the line may also be used to direct the piece as it is being lowered.

temporary traffic control (TTC) zone (3.5.2): An area of highway, street, or road where road user conditions are changed because of a work zone, an incident zone, or a planned special event through the use of devices, uniformed law enforcement officers, or other authorized personnel.

testing [electric] (4.5.18): To determine the presence of electricity.

tied in (5.6.6.11): Term to describe an arborist whose climbing line has been run through one or more branch unions or artificial anchor points and is attached to the arborist's saddle with a climbing hitch or mechanical device, permitting controlled movement.

touch potential (4.1.2[f]): The voltage between the energized grounded object and the person in contact with the object.

train (3.1.2): To provide a trainee under direct supervision with any activity intended to help them gain, improve, or retain specific knowledge, skills, or abilities on the job.

tripod/orchard ladder (7.5.9): A three-legged ladder that utilizes the third leg to form a freestanding tripod to stabilize itself. It is recommended for use on turf or soil or with use of a hard surface kit for better stability and to avoid slippage of the legs.

unassisted communication (4.5.15): definition in progress

unguarded [electricity] (5.6.6.3): Not guarded from approach or contact with electrical conductors.

unit (5.1.3): *definition in progress*

volt (V) (4.3.2): A unit of electric potential difference between two points. Lower-voltage systems are generally expressed in terms of volts (for example, 120 V or 240 V). See also *kilovolts (kV)*.

wheel chock (5.6.1.8): Manufactured or employer-approved wedge-shaped block designed to prevent unintentional movement of vehicle.

working-load limit (9.2.3): The working load that must not be exceeded for a particular application as established by a regulatory or standards-setting agency.

work line (9.2.2): Rope used for lifting, lowering, or guiding limbs or equipment, or both, into or out of the tree.

work plan (4.5.14.2): definition in progress

work-positioning system (8.1.1.1): An arborist climbing system designed to be used under tension to limit falls to no more than 2 ft and which supports the arborist on an elevated, vertical surface, such as a tree, and allows them to work with both hands free.

work site (3.3.7): Entire area where work will be performed as indicated during the job briefing, including:

- Areas that materials will be moved through (dragged, material handlers, cranes, etc.)
- Areas where material may fall or land, whether intentionally or not

• Areas where work vehicles and equipment are used or parked, including temporary traffic control (TTC) zones

work zone (9.6.1): The area of a roadway with construction, maintenance, or utility work activities.

A.2 List of Abbreviations

Annex development in progress.

Annex B: Recommended Guidelines for Standard Performance and Safety Training for Electrical Level 2, 3, or 4 Arborists/Electrical Level 2, 3, or 4 Arborist Trainees

(Informative)

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 nonuse of training aids that may be available is not evidence of noncompliance with this standard or annex.

B.1 General Requirements

Specific training to enable the safe and efficient completion of the work required of a qualified lineclearance arborist or qualified arborist should be provided by the employer, and documentation of training should be retained on file for the duration of employment.

B.1.1 Introduction and employer/employee responsibilities

B.1.2 Education and training should be appropriate and as applicable to employee job assignments.

B.1.3 Employee orientation is to include:

- job description appropriate to job assignment
- 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
- written acknowledgment by employee that they have participated in such training

B.1.4 Provide education and training on pruning techniques and safe work practices:

(a) in accordance with prevailing national standards for tree care operations pruning, or for utility pruning for those employees engaged under utility contracts in utility line clearance operations. Refer to Annex D, Additional Resources, for further information.

(b) in accordance with prevailing local, state, or regional pruning standards, and those utility pruning standards that may be specified by utility contracts for those employees engaged in utility line clearance operations.

(c) as well as tree knowledge, including predominant tree species within geographic area, such as identification, growth habits, structure, wood strength, and recognition/evaluation of potentially hazardous conditions related to tree structure. Refer to recommended resources in Annex D, Additional Resources.

B.2 General Safety

Provide education and training in general safety, applicable to employee job assignments, as it relates to:

B.2.1 Safety Regulations

Familiarize employees with the requirements of federal and/or state OSHA, Federal Motor Carrier Safety Regulations (FMCSA), and Federal Highway Administration as applicable to employee job assignments. Refer to recommended resources in Annex D, Additional Resources.

B.2.2 Industry Standards

Familiarize employees with the requirements in ANSI and other applicable standards. Refer to additional recommended standards in Annex D, Additional Resources.

B.2.3 Public Safety and Traffic Control

Use of public safety and traffic control devices as applicable under federal, state, or local regulations.

B.2.4 Electrical Hazards

Recognition and avoidance of electrical hazards.

B.2.5 Emergency Conditions

Proper procedures for safely performing nonroutine work such as storm/fire restoration efforts.

B.2.6 Job Briefings

Job-site-specific hazards associated with the job, hazard-mitigating work procedures, and specific employee assignments. Instruct employees about special precautions, personal protective clothing, and equipment requirements.

B.3 Personal Safety

Provide education and training in personal safety, applicable to employee job assignments, as it relates to:

B.3.1 Personal Protective Equipment (PPE)

Instruct employees in the proper use, inspection, care, fit, maintenance, and replacement of PPE.

B.3.2 Emergency Response Procedures

Furnish employees with appropriate information and training necessary to expedite a response to a worksite emergency, such as first aid, CPR, and aerial rescue (see Annex F, Aerial Rescue Flowchart).

B.3.3 Prevention of Back and Other Injuries

Techniques required to avoid back and other injuries.

B.3.4 Identification and Avoidance of Animals and Poison Plants

Identification of and the need to avoid contact with poisonous plants and instructions for treating insect stings/bites and snake bites.

B.3.5 Heat Illness

Awareness of heat illness risk, causal factors, prevention measures, recognition of symptoms, and first aid for an affected worker.

B.4 Equipment Safety

Provide education and training in equipment safety, applicable to employee job assignments, as it relates to:

B.4.1 Vehicles, Mobile, and Towed Equipment

Inspection, operation, and maintenance of all vehicles and equipment, such as aerial lifts, brush chippers, stump grinders, log loaders, tree cranes, mowing equipment, and pesticide application equipment. For drivers of commercial motor vehicles, such training shall include requirements of federal and state motor carrier safety regulations.

B.4.2 Aerial Equipment and Electrical Hazards

Required and recommended procedures for operating aerial devices in proximity to electrical hazards for those employees with the required qualifications to work in proximity to electric hazards.

B.4.3 Chain Saw, Power Tool, and Hand Tool Use and Safety

Use of chain saws, power tools, and hand tools in accordance with manufacturers' instructions.

B.4.4 Climbing Equipment Use and Safety

Inspection, maintenance, and storage of climbing equipment such as ropes, saddles, personal lanyards, rope snaps, carabiners, and related equipment.

B.5 Operational Safety

Provide education and training in operational safety, applicable to employee job assignments, as it relates to:

B.5.1 Climbing Safety

B.5.1.1 Includes, but is not limited to, preclimb inspection of tree and site, drop zone determination, climbing gear inspection, tie-in point selection, ascent methods, and planning of route, safe work methods aloft, aerial rescue procedures, communication with coworkers, and safe descent methods.

B.5.2 Rigging and Tree Removal

B.5.2.1 Knots and ropes, rigging techniques, tree strength and weight characteristics, and potential electrical hazards. Understanding and managing dynamic loads during rigging operations.

B.5.2.2 Use of rigging for the installation of tree support systems.

B.5.2.3 Identification and removal of hazard trees.

B.5.3 Hazard Communications

Awareness of potential exposure to hazardous substance and techniques to avoid exposure, in accordance with federal and state regulations as well as professional safe work practices.

B.5.4 Pesticide Use

Procedures for safe handling, mixing, application, and disposal of pesticide products, in accordance with federal and state regulations as well as professional safe work practices.

B.5.5 Fire Prevention

Awareness of the risks, prevention measures, and the appropriate response to fire, including, but not limited to, wildfire and the avoidance of wildfire smoke inhalation.

Annex C: General Safety Procedures

(Informative)

C.1 Lifting

Before lifting any weight, workers should

- 1. assess whether:
 - they can safely lift the weight and get a good grip, avoiding sharp edges, slivers, splinters, or other factors that might cause injury;
 - o the object is too large or awkward to lift and carry safely; and/or
 - o gloves will help get a good grip.
- 2. make sure there is a clear path and solid terrain that isn't slippery if the weight will be carried from one place to another.
- 3. make sure their muscles, especially in the lower back and legs, are warmed up and ready for exertion.
- 4. make a preliminary lift to be sure the load can be safely handled.
- 5. choose an alternative approach such as additional workers or material-handling equipment if the weight cannot be safely lifted.

When lifting the weight, workers should

- 1. place feet solidly on the walking surface.
- 2. avoid leaning forward by bending in the hips and knees to squat deeply while keeping the head up, shoulders back, and lower back straight.
- 3. hold the weight close to the body at waist height.
- 4. engage the core muscles while pushing on the ground to straighten the legs.

C.2 Control of Hazardous Energy

When a worker, hereafter referred to as the "authorized person," is doing mechanical work, precautions must be taken to prevent injury caused by moving or elevated parts, or the release of stored energy, such as hydraulic pressure. Failure to do so could result in a serious, potentially maining, or fatal injury. The authorized person performing maintenance/repair shall comply with the manufacturers' procedures.

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 to the Department of Labor, OSHA, 200 Constitution Avenue NW, Washington, DC 20210.

C.3 Manual Tree Felling Procedure

Before performing any work, conduct a site assessment and the following seven steps to determine whether a tree can be manually felled.

- 1. Hazards and Obstacles Identification Example of conditions to analyze include, but are not limited to:
 - (a) tree size in relationship to the landing zone,
 - (b) selected direction of fall,
 - (c) obstacles to avoid or clear from the felling path,
 - (d) vines or interlocking limbs,
 - (e) species and shape of tree,
 - (f) lean of tree,
 - (g) loose limbs, hangers, broken tops, chunks, or other overhead material,
 - (h) wind force and direction,

- (i) decay, cavities, or weak spots throughout the tree,
- (j) location of any electrical conductors or other wires,
- (k) tree cables, bracing, lightning protection, or other tree hardware,
- (l) size and terrain characteristics or limitations of work area,
- (m) potential for flying debris from tree impact,
- (n) adequate retreat path,
- (o) evidence of bees or wildlife habitation in tree,
- (p) poisonous plants,
- (q) water hazards,
- (r) ability to control access to work site,
- (s) authority to remove tree,
- (t) quality of wood fiber in hinge area,
- (u) root mass stability,
- (v) ice or snow load,
- (w) throwback or bounceback potential,
- (x) potential for spring poles,
- (y) lodged trees or dead snags in area,
- (z) access to tools or resources required for task,
- (aa) lightning damage,
- (bb) potential for barber chair, and
- (cc) foreign objects, nails, wire fence, concrete, etc.

2. Lean(s)

Determine side lean from the fall direction, then go 90° adjacent and determine front or back lean. (Note: The side lean may influence the retreat path [escape route] as well as the back cut to be used. Heavy, forward-leaning trees may represent a risk of barber chair.)

3. Retreat Path/Escape Route (planned retreat direction)

Select a route that is 45° to the rear of the tree and, when possible, to the opposite side of the natural side lean of the tree.

4. Notch Plan

Select and cut a notch (open face, conventional, or Humboldt) that is best suited to allow the tree to fall safely in the desired direction.

5. Hinge Plan

Determine the type and characteristics of the hinge. Uncut wood between the notch and back cut is recommended to have a width that is 10 percent of diameter at breast height (DBH) and a hinge length that is 80 percent of the tree's diameter.

6. Back Cut Plan

Select and make a felling cut, such as bore cut, stepped cut(s), or level back cut(s); also use assistance, such as wedge(s), work line(s), or machinery. Before making a back cut, give an audible command, such as "Stand Clear," and wait for a response, such as "All Clear."

7. Retreat

Use a retreat path (escape route) out to a safe distance. If the tree has not fallen, use work line(s) or machinery in place to start the fall of the tree. Once the tree is on the ground, wait for movement to stop and check for hanging or lodged hazards before approaching.

C.4 Climber Anchorage Selection Guidance

Before beginning the climb, the climber shall inspect the tree and the intended anchorage point to assess load-bearing capacity in relation to the anticipated loads.

- 1. The tree shall be visually inspected for potential hazards. Loads are borne by the anchor point, the stems that support it, the trunk, and the roots. Failure can occur in any part of the tree that bears the loads, and the climber must carefully inspect the tree to assess its load-bearing capacity at all points between the anchor point and the roots.
- 2. The load-bearing capacity of an anchor is determined by the inherent wood property of the species and the presence of defects. The defects to analyze at the intended anchor points and branch include, but are not limited to:
 - cavities
 - cracks
 - decay
 - dieback
 - included bark
 - taper
- 3. The load-bearing capacity is also determined by the diameter of the anchor point. The climber shall take care to select an anchor point of sufficient diameter to reduce the likelihood of failure due to a defect not visible from the ground.
- 4. The climber shall also consider their weight and actions will affect the loads on the anchor point and branch. The actions to consider include:
 - (a) whether the applied load of the climber will cause a bending moment or torque on the anchor point or part of the tree.
 - (b) the climbing system employed. Moving rope systems will create different loads on an anchor than stationary rope systems.
 - i. Within stationary rope systems, an anchor will be subject to different loads when used as canopy anchor than when used as the suspension point for a basal anchor system.

Annex D: Additional Resources

(Informative)

D.1 Applicable American National Standards

ANSI A300 Tree Care Standards (2023)

Boom-Supported Elevating Work Platforms (ANSI/SAIA A92.5-2006 [R2014])

High-Visibility Safety Apparel (ANSI/ISEA 107-2020)

Industrial Head Protection (ANSI/ISEA Z89.1-2014 [R2019])

Ladders - Portable Metal - Safety Requirements (ANSI ASC A14.2-2017)

Ladders - Wood - Safety Requirements With Errata (ANSI ASC A14.1-2007)

Minimum Requirements for Workplace First Aid Kits and Supplies (ANSI/ISEA Z308.1-2021)

Occupational and Educational Personal Eye and Face Protection Devices (ANSI/ISEA Z87.1-2020)

Practices for Respiratory Protection (ANSI/ASSE Z88.2-2015)

Vehicle-Mounted Elevating and Rotating Aerial Devices (ANSI/SAIA A92.2-2021)

Workplace Walking/Working Surfaces and Their Access; Workplace, Floor, Wall and Roof Openings; Stairs and Guardrail/Handrail Systems (ANSI/ASSE A1264.1-2017)

D.2 Other Applicable Standards

Articulating Boom Cranes (ASME B30.22-2016)

Mobile and Locomotive Cranes (ASME B30.5-2021)

Multiposition Small Engine Exhaust System Fire Ignition Suppression (SAE Standard J335-2020)

Standard Specification for Leg Protection for Chain Saw Users (ASTM F1897-20)

Standard Specifications for Personal Climbing Equipment (ASTM F887-20)

Standard Test Method for Measurement of Cut Resistance to Chainsaw in Lower Body [Legs] Protective Clothing (ASTM F1414-19)

USDA Forest Service Standard for Spark Arresters for Internal Combustion Engines (USDA Forest Service Specification 5100-1d [February 2013])

D.3 Applicable Federal Regulations (Occupational Safety and Health Administration, Federal Motor Carrier Safety Administration, and Federal Highway Administration)

The Control of Hazardous Energy (Lockout/Tagout) (29 CFR 1910.147)

Electric Power Generation, Transmission, and Distribution (29 CFR 1910.269)

Electrical – Safety-Related Work Practices (29 CFR 1910, Subpart S [1910.331– 1910.335]) Fall-Arrest Systems (29 CFR 1910, Subpart I [1910.140] Federal Motor Carrier Safety Regulations; General (49 CFR, Part 390) Fire (36 CFR 261.52) Hazard Communication (29 CFR 1910.1200) Manual on Uniform Traffic Control Devices (https://mutcd.fhwa.dot.gov/pdfs/2009r1r2r3/pdf_index.htm) Permit-Required Confined Spaces (29 CFR 1910.146) Personal Protective Equipment (29 CFR 1910, Subpart I [1910.132–1910.138]) Slings (29 CFR 1910.184)

Traffic Control Devices on Federal-Aid and Other Streets and Highways (23 CFR, Part 655, Subpart F)

D.4 Other Resources

Cordage Institute Rope Standards/The Cordage Institute (www.ropecord.com)

Globally Harmonized System of Classification and Labelling of Chemicals [GHS]

- (www.osha.gov/hazcom/global)National Institute for Occupational Safety and Health/Fatality Assessment and Control Evaluation Program (www.cdc.gov/niosh/face)
- Occupational Safety and Health Administration/Safety and Health Topics/Tree Care Industry (www.osha.gov/tree-care)
- Occupational Safety and Health Administration/Safety and Health Topics/Landscape and Horticultural Services (www.osha.gov/landscaping)
- Personal Protective Equipment for the Prevention of Falls from a Height. Low Stretch Kernmantel Ropes (BS EN 1891:1998)

D.5 Associations

International Society of Arboriculture; 270 Peachtree Street NW, Suite 1900, Atlanta, GA 30303 (www.isa-arbor.com)

Tree Care Industry Association, Inc.; N Commercial Street, Suite 201, Manchester, NH 03101 (<u>www.tcia.org</u>)

Annex E: Weight of Green Logs

(Informative)

The green log weight chart found in this annex is one of many charts that estimate the weight of green (living) wood. Green wood has many growth factors besides species; area of the country, local topography, soil nutrients, time of year, and more will affect the weight of the wood. There are also apps for estimating weights of green logs.

How to use the chart:

1. Know the species of the tree you are working with, if the exact species is not known or not listed in the chart then select the species most similar to your tree.

2. Match the diameter of the wood section you are working with, with the closest diameter (in inches) at the top of the chart.

3. Follow species row until it meets the diameter column. The number in the chart is the estimated weight of a 1 ft long, round section of that diameter species of wood.

Example:

Follow **ROW** Acer rubrum (red maple) to **COLUMN** 20" in diameter to find **109**.

The 109 is an estimation of the weight in pounds of a 1 ft long, 20" in diameter, red maple round. For a rough estimate of a 4 ft x 20 in diameter log of red maple: $109 \times 4 = 436$ pounds.

		Weight, pounds	Weight of a 1 ft section, based on average diameter							
Scientific name	Common name	per ft ³	10″	12″	14″	16″	18″	20″	22″	24″
Abies concolor	white fir	47	25	37	50	66	83	102	124	148
Abies procera	noble fir	29	16	23	31	41	51	63	77	91
Acer rubrum	red maple	50	27	39	53	70	88	109	132	157
Acer saccharinum	silver maple	45	25	35	48	63	79	98	119	141
Acer saccharum	sugar maple	56	31	44	60	78	99	122	148	176
Aesculus hippocastanum	horsechestnut	41	22	32	43	57	72	89	108	129
Alnus rubra	red alder	46	25	36	49	64	81	100	121	144
Betula papyrifera	paper birch	50	27	39	53	70	88	109	132	157
Calocedrus decurrens	incense-cedar	45	25	35	48	63	79	98	119	141
Carya illinoensis	pecan	61	33	48	65	85	108	133	161	192
Carya ovata	shagbark hickory	64	35	50	68	89	113	140	169	201
Celtis occidentalis	hackberry	50	27	39	53	70	88	109	132	157
Diospyros virginiana	persimmon	63	34	49	67	88	111	137	166	198
Eucalyptus camaldulensis	red gum	50	27	39	53	70	88	109	132	157
Fagus spp.	beech	54	29	42	58	75	95	118	142	169
Fraxinus americana	white ash	48	26	38	51	67	85	104	126	150
Fraxinus latifolia	Oregon ash	48	26	38	51	67	85	104	126	150

Fraxinus pennsylvanica	green ash	47	25	37	50	66	83	102	124	148
Gleditsia triacanthos	honeylocust	61	33	48	65	85	108	133	161	192
Juglans nigra	black walnut	58	32	45	62	81	102	126	153	182
Larix spp.	larch	51	28	40	54	71	90	111	135	160
Liquidambar styraciflua	sweetgum	55	30	43	58	77	97	120	145	173
Liriodendron tulipifera	yellow poplar, tuliptree	38	21	30	40	53	67	83	99	199
Melia azedarach	Chinaberry	50	27	39	53	70	88	109	132	157
Nyssa sylvatica	black gum	45	25	35	48	63	79	98	119	141
Picea rubens	red spruce	34	19	27	36	47	60	74	90	106
Picea sitchensis	Sitka spruce	32	17	25	34	45	56	70	84	100
Pinus contorta	lodgepole pine	39	21	30	41	55	69	85	103	122
Pinus elliottii	slash pine	58	32	45	62	81	102	126	153	182
Pinus lambertiana	sugar pine	52	28	41	55	72	92	113	137	163
Pinus monticola	western white pine	36	20	28	38	50	64	78	95	113
Pinus palustris	longleaf pine	55	30	43	58	77	97	120	145	173
Pinus ponderosa	ponderosa pine	46	25	36	49	64	81	100	121	144
Pinus strobus	eastern white pine	36	20	28	38	50	64	78	95	113
Pinus taeda	loblolly pine	53	29	41	56	74	93	116	140	166
Platanus occidentalis	sycamore	52	28	41	55	72	92	113	137	163
Populus spp.	cottonwood	49	27	38	52	68	86	107	129	154
Populus tremuloides	quaking aspen	43	23	34	46	60	76	94	114	135
Prunus serotina	black cherry	45	25	35	48	63	79	98	119	141
Pseudotsuga menziesii	Douglas-fir	39	21	30	41	55	69	85	103	122
Quercus alba	white oak	62	34	48	66	86	109	135	163	194
Quercus coccinea	scarlet oak	64	35	50	68	89	113	140	169	201
Quercus kelloggii	California black oak	66	36	51	70	92	116	144	174	207
Quercus palustris	pin oak	64	35	50	68	89	113	140	169	201
Quercus robur	English oak	52	28	41	55	72	92	113	137	163
Quercus rubra	red oak	63	34	49	67	88	111	137	166	198
Quercus stellata	post oak	63	34	49	67	88	111	137	166	198
Quercus virginiana	live oak	76	41	60	81	106	134	166	200	238
Robinia pseudoacacia	black locust	58	32	45	62	81	102	126	153	182
Salix spp.	willow	32	17	25	34	45	56	70	84	100
Sequoia sempervirens	coast redwood	50	27	39	53	70	88	109	132	157
Taxodium distichum	baldcypress	51	28	40	54	71	90	111	135	160
Thuja plicata	western red cedar	28	15	22	30	39	49	61	74	88
Tilia americana	basswood	42	23	33	45	59	74	92	111	132
Tsuga canadensis	eastern hemlock	49	27	38	52	68	86	107	129	154
Tsuga heterophylla	western hemlock	41	22	32	43	57	72	89	108	129
Ulmus americana	American elm	54	29	42	58	75	95	118	142	169

Annex F: Aerial Rescue Flowchart

(Informative)

Annex development in progress.

Annex G: Hand Signals for Crane Operations

(Informative)

Annex development in progress.

Annex H: Electrical Hazard Abatement

(Informative)

(See Section 4.3.13 of the standard.)

H.1 Abatement

When an arborist cannot safely maintain the applicable minimum approach distance (MAD) from energized electric conductors, or arborist work cannot be safely completed with the line energized, the arborist must stop work on that assignment until an electrical hazard abatement plan is implemented.

An electrical hazard abatement plan may include a request for the utility to deenergize, test, and ground the electric supply lines at the work site to make it as safe as practicable for the arborist to work closer to deenergized conductors than allowed when the conductors are electrically energized. For arborists who are not line-clearance qualified, the hazard abatement plan may require they hire a qualified line-clearance arborist or contractor to perform the work.

H.2 Communication

When an arborist's electrical hazard abatement plan includes a request that the electrical system owner/operator deenergize, test, and ground the electrical conductors, precautions must be taken to ensure clear and thorough communications between the arborist and the onsite, qualified utility employee responsible for deenergizing and grounding the conductors. Failure to effectively communicate and maintain safe work practices could result in severe, potentially fatal, injury.

H.3 General Requirements

- 1. The electrical system owner/operator has the expertise, responsibility, and authority for deenergizing, testing, grounding, and reenergizing the conductors.
- 2. Arborist employees shall treat all conductors and equipment as energized and maintain MADs to energized conductors until they have confirmed that the utility has deenergized and tested the line and that grounding is in place to make the electric supply lines as safe as practicable for arborist work.
- 3. Arborists shall avoid all direct contact with the deenergized conductors because deenergized lines should never be considered 100 percent electrically safe under all conditions.

4. Arborists shall avoid dropping brush/limbs on the deenergized electric supply lines, poles, or equipment.

Sample Procedures

Sequence for working in proximity to deenergized and grounded electrical conductors

- The arborist supervisor shall request that the designated utility supervisor in charge coordinate communications and actions (i.e., times, locations, and designated contact persons at worksite where deenergizing, testing, and grounding is to apply) between the arborist crew leader and the utility crew leader performing the deenergizing, testing, and grounding.
- 2. At the worksite, a designated arborist employee in charge will be identified to the designated qualified utility employee in charge of deenergizing, testing, and grounding the conductors.
- 3. All arborist employees will maintain MADs until the arborist employee in charge has been notified by the qualified utility employee in charge that:
- a. the deenergizing, testing, and grounding has been completed in accordance with the electrical system owner/operator grounding procedures, creating a safety zone for the arborist to perform work; and
- b. the designated arborist employee in charge has visually confirmed, with the guidance of the designated qualified utility employee applying the ground(s), that protective ground(s) have been installed as close as practicable to the line-clearance or arborist work to be performed to prevent hazardous differences in electrical potential.
 - 4. It may be necessary to have the protective ground(s) moved by the utility if the arborist work progresses beyond the original worksite. If the ground(s) must be moved, Steps 1 through 3 must be repeated. The arborist crew leader must be able to visually confirm that protective ground(s) have been installed as required by the utility.

Sequence for reenergizing conductors

 After completing the line-clearance or arborist work, the designated arborist employee in charge will verify that all arborist employees are outside of the MADs from the electric supply lines. The arborist will then inform the designated qualified utility employee in charge that the work is complete and that arborist employees are outside of the MADs. The qualified utility employee(s) may now reenergize the lines. The arborist employees shall immediately treat the electrical conductors as energized and resume maintaining MADs as specified in Table 4 (for qualified line-clearance arborists), Table 3 (for Electrical Level 3 Arborists), Table 2 (for Electrical Level 2 Arborists), or Table 1 (for Electrical Level 1 Arborists).

Annex I: Insulating Pruning Tools

(Informative)

(From 29 CFR 1910.269 – Electric Power Generation, Transmission, and Distribution)

(j) Insulating Pruning Tools

(1) **Design of tools.** Insulating pruning tools shall be designed and constructed to withstand the following minimum tests:

(i) If the tool is made of fiberglass-reinforced plastic (FRP), it shall withstand 100,000 V/ft (328,100 V/m) of length for 5 minutes;

Note to paragraph 29 CFR 1910.269 (j)(l)(i): Live-line tools (insulating pruning tools) using rod and tube that meet ASTM F71I-02 (2007), *Standard Specification for Fiberglass-Reinforced Plastic (FRP) Rod and Tube Used in Live Line Tools,* are deemed to comply with paragraph (j)(l) of this section.

- (ii) If the tool is made of wood, it shall withstand 75,000 V/ft (246,100 V/m) of length for 3 minutes; or
- (iii) The tool shall withstand other tests that the employer can demonstrate are equivalent.

Annex J: Fall-Protection Systems (Informative)

Note: These illustrations are not intended to show all equipment/scenarios.



Work-Positioning System

Equipment designed for use under tension to limit falls to no more than 2 ft (0.3 m) and which supports the arborist on an elevated, vertical surface, such as a tree, and allows them to work with both hands free.

Fall-Arrest System

Equipment specifically designed to arrest a fall from an elevated position. The system is comprised of a full-body harness, an energy-absorbing connecting component, and an anchorage.

Travel-Restraint System

Equipment designed to limit travel in such a manner so as to prevent the worker from a free fall.

Suspension System

Equipment designed to support all of the person's weight, including equipment, for the purpose of accessing a work location. Not intended to arrest a fall.

