

American National Standard

**for Arboricultural Operations—
Safety Requirements**

ANSI Z133.1-2006



- 3.5.4 Smoking shall be prohibited when handling or working around flammable liquids.
- 3.5.5 Clothing contaminated by flammable liquid shall be changed as soon as possible.
- 3.5.6 Open flame and other sources of ignition shall be avoided.

4 ELECTRICAL HAZARDS

4.1 General

- 4.1.1 All overhead and underground electrical conductors and all communication wires and cables shall be considered energized with potentially fatal voltages.
- 4.1.2 The employer shall certify that each employee has been trained to recognize and is appropriately qualified to work within proximity to electrical hazards that are applicable to the employee's assignment.
- 4.1.3 Arborists and other workers shall be instructed that
 - (a) electrical shock will occur when a person, by either **direct contact** 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.
 - (b) electrical shock may occur as a result of **ground fault** when a person stands near a grounded object (for example, if an uninsulated aerial device comes into contact with a conductor with outriggers down).
 - (c) in the event of a downed energized electrical conductor or energized grounded object, there exists the hazard of **step potential**.
- 4.1.4 If the **minimum approach distance** for a **qualified line-clearance arborist** (shown in Table 1) or for a qualified arborist (shown in Table 2) cannot be maintained during arboricultural operations, the **electrical system owner/operator** shall be advised and an electrical hazard abatement plan implemented before any work is performed in proximity to energized electrical conductors.

4.2 Working in Proximity to Electrical Hazards

- 4.2.1 The items contained in section 4.1 shall always be included in the review of this section.
- 4.2.2 An inspection shall be made by a qualified arborist to determine whether an **electrical hazard** exists before climbing, otherwise entering, or performing work in or on a tree.

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

Nominal voltage in kilovolts (kV) phase to phase	Includes 1910.269 elevation factor, sea level to 5,000 ft*		Includes 1910.269 elevation factor, 5,000–10,000 ft*		Includes 1910.269 elevation factor, 10,001–14,000*	
	ft-in	m	ft-in	m	ft-in	m
0.051 to 0.3	Avoid contact		Avoid contact		Avoid contact	
0.301 to 0.75	1-01	0.33	1-03	0.38	1-04	0.41
0.751 to 15.0	2-05	0.70	2-09	0.81	3-00	0.88
15.1 to 36.0	3-00	0.91	3-05	1.04	3-09	1.00
36.1 to 46.0	3-04	1.01	3-10	1.16	4-02	1.09
46.1 to 72.5	4-02	1.26	4-09	1.44	5-02	1.30
72.6 to 121.0	4-06	1.36	5-02	1.55	5-07	1.68
138.0 to 145.0	5-02	1.58	5-11	1.80	6-05	1.96
161.0 to 169.0	6-00	1.80	6-10	2.06	7-05	2.23
230.0 to 242.0	7-11	2.39	9-00	2.73	9-09	2.95
345.0 to 362.0	13-02	3.99	15-00	4.56	16-03	4.94
500.0 to 550.0	19-00	5.78	21-09	6.60	23-07	7.16
765.0 to 800.0	27-04	8.31	31-03	9.50	33-10	10.29

*Exceeds phase to ground; elevation factor per 29 CFR 1910.269.

Note: At time of publication, the minimum approach distances in this table for voltages between 301 and 1,000 volts exceed those specified by 29 CFR 1910.269, in anticipation of OSHA adopting these distances during the life of ANSI Z133.1-2006.

- 4.2.3 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.
- 4.2.4 A second qualified line-clearance arborist or line-clearance arborist trainee shall be within visual or voice communication during line-clearing operations aloft when an arborist must approach closer than 10 feet (3.05 m) to any energized electrical conductor in excess of 750 volts (**primary conductor**) or when
- branches or limbs are being removed, which cannot first be cut (with a nonconductive pole pruner/pole saw) to sufficiently clear electrical conductors, so as to avoid contact; and/or
 - roping is required to remove branches or limbs from such electrical conductors.

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

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

*Exceeds phase to ground per 29 CFR 1910.333.

phase to ground (Tables 1 and 2): The electric potential (voltage) between a conductor and ground.

phase to phase (4.1.3[a]): The electrical potential (voltage) between two conductors, each having its own electric potential relative to ground.

primary conductor (4.2.4): Any conductor, including aluminum, copper, or aluminum conductor steel reinforced (ACSR), that is bare, covered, or insulated, with a nominal voltage above 750 volts.

proximity (3.4.2): An area within 10 feet (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 4/10 inch (10 mm) for each additional kV.

Prusik loop (8.1.9): An endless loop of rope used to fashion a Prusik knot. The endless loop may be spliced or knotted with, at minimum, a double fisherman's knot.

qualified arborist (3.1.3): 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.

qualified arborist trainee (8.4.12): 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.

qualified crane operator (5.7.9.2): An individual who, by reason of a recognized credential or professional standing, or through related training and on-the-job experience, is familiar with the equipment and hazards involved with arboriculture crane operations and who has demonstrated competence in operating a crane and performing the special techniques involved.

qualified line-clearance arborist (4.1.4): 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 currently be employed by a line-clearance contractor.

qualified line-clearance arborist trainee (4.2.3): An individual undergoing line-clearance training under the direct supervision of a qualified line-clearance arborist. In the course of such training, the trainee becomes familiar with the equipment and hazards in line clearance and demonstrates ability in the performance of the special techniques involved.

qualified personnel (5.1.5): 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.