

Distribution System Vegetation Management, Overhead, Clearances and Methods



Table of Contents

1. Scope	2
2. Application	2
3. Objectives	2
4. Definitions	3
Figure 4a. Branch Collar	4
Figure 4b. Scaffold Branches and Lateral Branches	4
Figure 4c. Basic Elements of the Distribution System	5
5. Requirements	5
5.1 General	5
5.2 Clearance Requirements at Time of Pruning	6
5.3 Primary Overhead Power Lines and Equipment	6
5.4 Secondary Lines and System Neutral Lines	6
5.5 Pole to Pole Service Lines	6
5.6 Service Lines and Service Bridles	6
5.7 Utility Poles and Down Guys	6
5.8 Power Meters	6
5.9 Cable Internet/Television and Communication Lines and Streetlights	6
6. Pruning Guidelines	7
Table 6.1 Side and Overhang Clearance Pruning Distances for Fast and Slow Growing Species	7
Table 6.2 Pruning Cuts for Coniferous and Deciduous Trees in Single and Three Phase Systems	7

Standards Coordinator
 Laura Vanderpool

Standards Engineering Supervisor
 John Shipek

Division Director
 Andrew Strong

Figure 6.1	Single Phase Distribution Powerline, Side Pruning, Conifer	8
Figure 6.2	Single Phase Distribution Powerline, Directional Pruning, Deciduous...	9
Figure 6.3	Three Phase Distribution Powerline, Heading Cut, Conifer	10
Figure 6.4	Three Phase Distribution Powerline, Side Pruning, Conifer	11
Figure 6.5	Three Phase Distribution Powerline, Directional Pruning, Conifer ...	12
7.	Methods	13
8.	References	13
9.	Sources	13

1. Scope

This work practice covers the required clearance distances between Seattle City Light (SCL) power assets rated 26.4 kV and below and trees and vegetation, along with recommended tree pruning methods.

Required clearances for power assets rated above 26.4 kV are outside the scope of this standard.

2. Application

This work practice is for contractors and SCL employees who prune vegetation encroaching on power lines, transformers, and other SCL power assets energized at 26.4 kV and below.

This work practice is applicable to most situations. For specialized pruning situations where additional consideration is required, contact the SCL Vegetation Management Supervisor.

3. Objectives

This work practice sets forth:

- Definitions of terms
- General requirements including crew staffing for work projects
- Clearance requirements
- Pruning guidelines
- Methods

SCL recognizes the impact of aesthetics in tree pruning. However, Power Line Clearance tree pruning crews must ensure that power lines and power assets, such as transformers, utility poles, conductors, and down guys, have sufficient clearance from vegetation for emergency and necessary maintenance work. Therefore, SCL contractor crews prune for safety and reliability, while also considering tree health. This work is managed through consistent oversight by SCL's professional arboricultural and electrical staff.

This work practice is based upon the best available science, industry regulations, industry best management practices, industry standards, and the experience of SCL's International Society of Arboriculture (ISA) certified arborists and ISA Utility Specialist certified arborists.

The SCL distribution system includes over 1,700 circuit miles of power lines which require vegetation management. Clearance distances are based upon a variety of factors as described in Section 5.1 below. Clearance distance data from a 2018 SCL survey of other power utilities and electrical cooperatives was also considered. See appendix for more information.

4. Definitions

Apical Dominance: The ability of a main stem or branch to dominate and inhibit the growth and development of other branches.

Branch Collar: The swollen area of trunk tissue that forms around the base of a branch. See Figure 4a.

Branches: Two basic types of branches are described in this work practice. See Figure 4b.

- **Scaffold branches** are primary limbs that form the canopy of a tree.
- **Lateral branches** are branches that emerge from scaffold branches.

Cable internet/television and communication lines: Lines not owned or maintained by Seattle City Light that provide cable internet, television, and communication. Vegetation is not maintained away from these lines.

Conifer Tree: A tree that usually retains leaves year-round and has needle-shaped or scale-like leaves and may produce cones or berry-like fruit.

DBH: The diameter of a tree trunk measured at 4.5 feet off the ground. Originally DBH stood for “diameter at breast height.”

Deciduous Tree: A tree that loses its leaves seasonally.

Directional Pruning: A pruning method whereby branches growing toward power infrastructure are pruned back to lateral branches large enough to assume apical dominance which directs growth away from power infrastructure.

Distribution System: Carries electricity from the substation where it is stepped down from 115 kV–230 kV to 26.4 kV, then distributed via overhead lines to customers’ transformers. See Figure 4c.

Heading Cut: A pruning cut that removes a branch or stem between nodes (leaving a stub); or to a bud; or to a live branch typically less than one-third the diameter of the branch or stem being removed.

Make-Ready: A service offered for certain trees, based on an SCL staff member evaluation, in which power line qualified arborists prune trees far enough from power lines to enable non-power line qualified arborists to prune/remove those trees. This service may be requested by calling (206) 386-1733.

Neutral Line: Current-carrying conductor of a power substation. It has the important job of carrying imbalanced electrical current back to the substation and transformer. While the neutral wire is grounded at multiple points along the circuit, it should be treated as a “live wire.”

Node: The position on a branch or stem where leaves form.

Primary Line: Conductors that carry primary or “high” voltage, which is usually between 4 kV and 26.4 kV (4,000 volts and 26,400 volts).

Secondary Lines: Conductors that carry secondary voltage, which is usually between 120 volts and 480 volts. Frequently referred to as “pole-to-pole secondaries.”

Service Bridle: a non-energized assembly of wires and clamps used to facilitate mid-line or “floating” anchoring of a service line at a point other than its primary point of connection at a pole.

Service Line: An overhead electrical secondary line running from a utility pole or service bridle to a customer’s building or other premises.

Side Pruning: The complete removal of scaffold or lateral branches where they attach to the trunk of a tree, retaining branch collars, to achieve standard clearances.

Tree Species Growth Rates: For the purpose of this work practice, tree growth rates are defined as follows:

- **Fast Growing Tree Species:** Grows approximately 25" or more per year.
- **Medium Growing Tree Species:** Grows approximately 12" to 25" per year.
- **Slow Growing Tree Species:** Grows approximately 1" to 12" per year.

Trunk: The main or primary stem or stems of a tree.

Watersprouts: Growth that arises from latent buds on a tree branch or trunk. Watersprouts are typically thin, straight, fast-growing shoots, and may occur in response to pruning or injury.

Figure 4a. Branch Collar

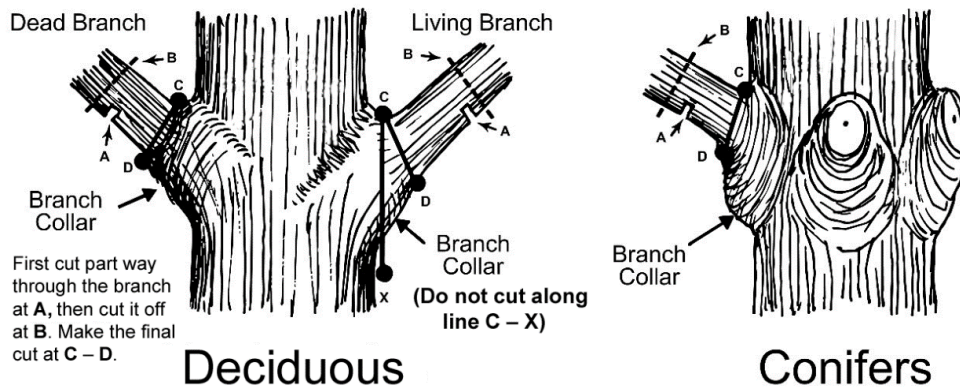


Figure 4b. Scaffold Branches and Lateral Branches

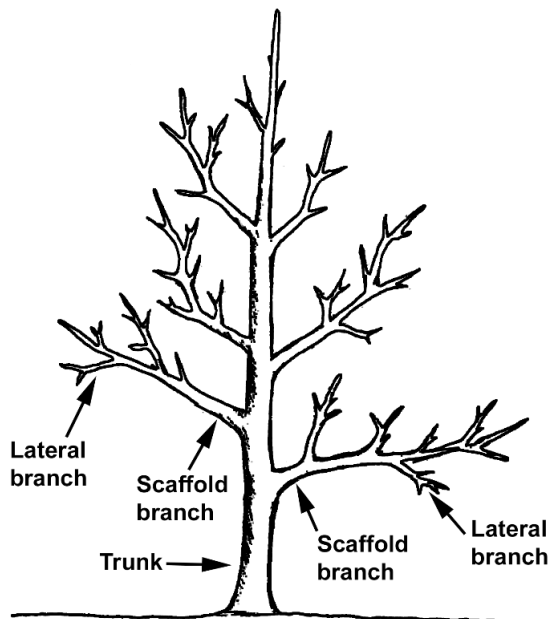
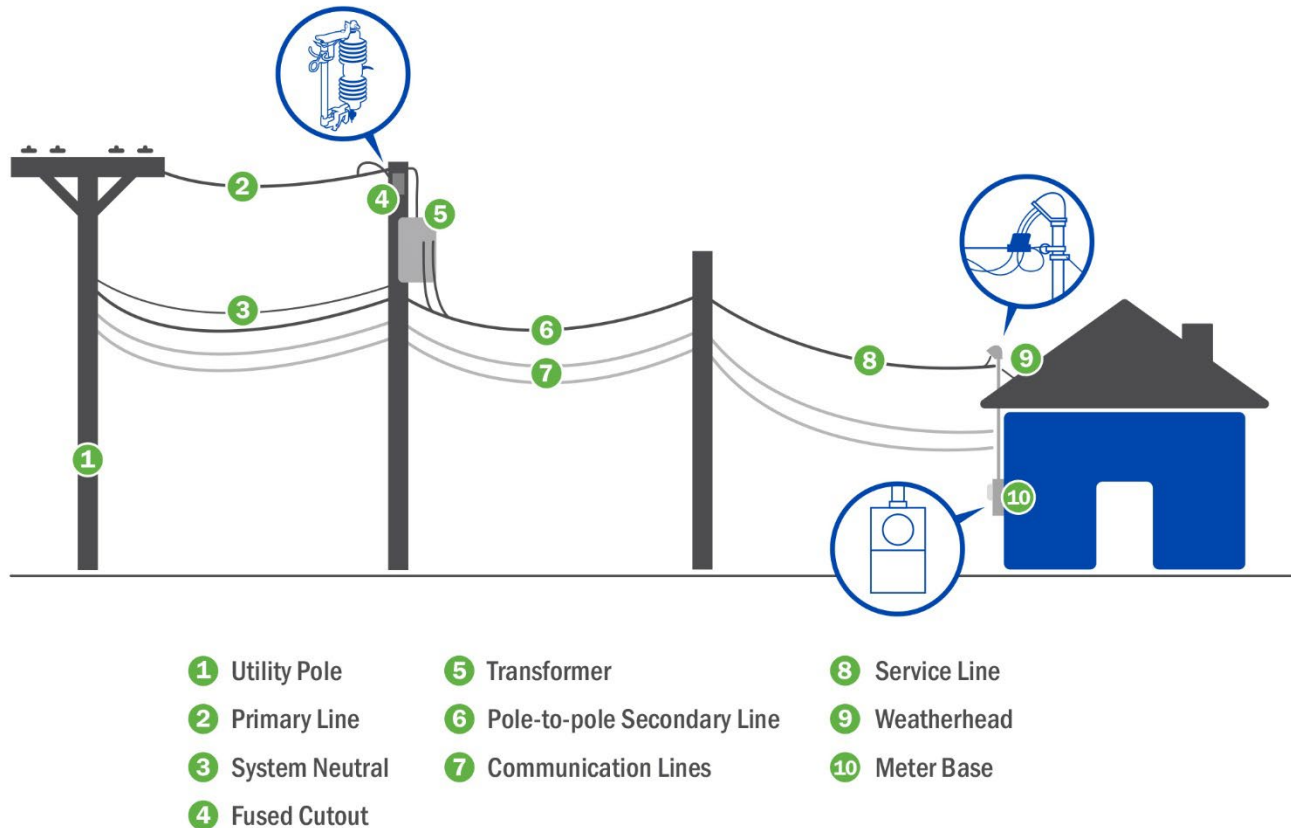


Figure 4c. Basic Elements of the Distribution System



5. Requirements

5.1 General

Pruning clearances for SCL are determined by:

- Tree species and related factors (growth rates, growth patterns, tree failure characteristics)
- Site conditions (soils, hydrology, slopes)
- Voltage of nearby power lines
- Proximity to other elements of the SCL system (transformers, poles, down guys)

Each contractor tree pruning crew shall have an ISA certified arborist as a crew member. This requirement may be waived if completing emergency tree work.

When pruning cannot mitigate a tree's potential hazard to the SCL electrical system, or growth rate of trees causes recurring maintenance and outage issues, certain trees may be removed. Tree removal decisions must be made by SCL Vegetation Management or SCL's authorized representative, ISA certified arborists.

Trees shall be pruned to the specifications and methods listed below.

5.2 Clearance Requirements at Time of Pruning

Proper pruning requires that pruning cuts are made at the trunk, or to a scaffold or a lateral branch that is large enough to assume apical dominance of a branch. This promotes natural outward growth of the branch and reduces the growth of reactive watersprouts at the pruning cut.

Crews shall prune to a proper lateral branch in most situations. As a result, the ultimate clearance distance may be greater than that listed below.

In certain situations, in order to avoid removing trees, SCL tree pruning crews will make heading cuts on trees growing directly underneath or immediately adjacent to overhead equipment to obtain the necessary clearance distances. A tree pruned in this way will continue to provide ecosystem benefits such as wildlife habitat, storm water and particulate matter uptake, and shade. However, heading cuts are not always an option. Trees that are determined to be an unacceptable risk to system reliability and/or public safety will be removed.

5.3 Primary Overhead Power Lines and Equipment

Clearance: Around primary distribution lines, at least 10 feet of clearance will be provided for most tree species. Faster growing species such as Big Leaf Maple, Black Cottonwood, and Red Alder may require more clearance than 10 feet where practical and desirable. Some slower growing species such as Spruce and certain Oak species may be pruned to a distance of less than 10 feet, depending upon site variables and professional experience of ISA certified arborists.

Certain conifer species with a DBH greater than 20 inches may be side-pruned to the main trunk provided there is greater than 5 feet of clearance between the conductor(s) and the main trunk. No branches directed within 120 degrees of conductor shall be allowed to remain.

Overhang Clearance: Fifteen feet of overhead clearance will be provided from vegetation and primary overhead distribution lines.

5.4 Secondary Lines and System Neutral Lines

Clearance shall be 5 feet for fast growing species, and 3 feet for slow growing species.

5.5 Pole-to-Pole Service Lines

Clearance shall be 3 to 5 feet for spans.

5.6 Service Lines and Service Bridles

Clearance shall be 3 to 5 feet for the first 10 feet from where the service lines attach to a pole or bridle point.

5.7 Utility Poles and Down Guys

Clearance shall be 3 feet for safe access and maintenance.

5.8 Power Meters

Must be accessible for meter readers and electrical workers to inspect and maintain.

5.9 Cable, Television, and Communication Lines and Streetlights

SCL does not maintain vegetation from cable, television, and communication lines or streetlights.

6. Pruning Guidelines

Table 6.1 shows side and overhang clearance pruning distances.

For pictorial representation of clearance distances as they apply to deciduous and coniferous trees, see Table 6.2 and Figures 6.1–6.5.

Table 6.1 Side and Overhang Clearance Pruning Distances for Fast and Slow Growing Species

Line Type	Side Clearance (at time of pruning)		Overhang Clearance (at time of pruning)	
	Fast Growing Species	Slow Growing Species	Fast Growing Species	Slow Growing Species
Primary Lines – 4 kV to 26.4 kV	10' - 14'	<10' to 10'	15'	15'
Secondary Lines – less than 600 V and Neutral	5'	3'	5'	3'
Pole-to-Pole Service Lines	5'	3'	5'	3'
Service Lines and Service Bridles (first 10' from connection to SCL system)	5'	3'	5'	3'
Utility Poles and Down Guys	3'	3'	3'	3'

Table 6.2 Pruning Cuts for Coniferous and Deciduous Trees in Single and Three Phase Systems

System	Pruning Cut	Tree Type	Figure
Single Phase	Side	Conifer	6.1
Single Phase	Directional	Deciduous	6.2
Three Phase	Heading	Conifer	6.3
Three Phase	Side	Conifer	6.4
Three Phase	Directional	Deciduous	6.5

Figure 6.1 Single Phase Distribution Powerline, Side Pruning, Conifer

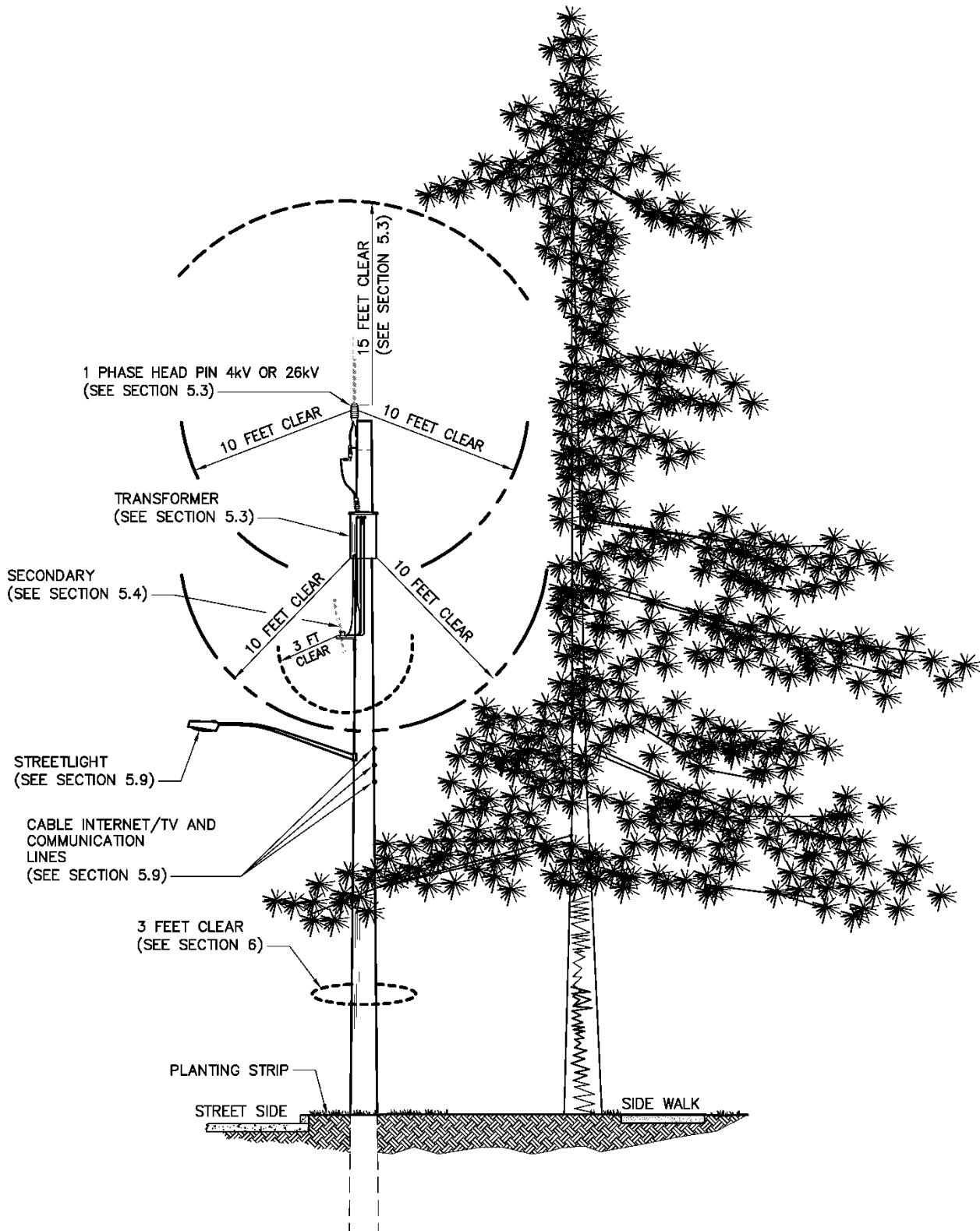


Figure 6.2 Single Phase Distribution Powerline, Directional Pruning, Deciduous

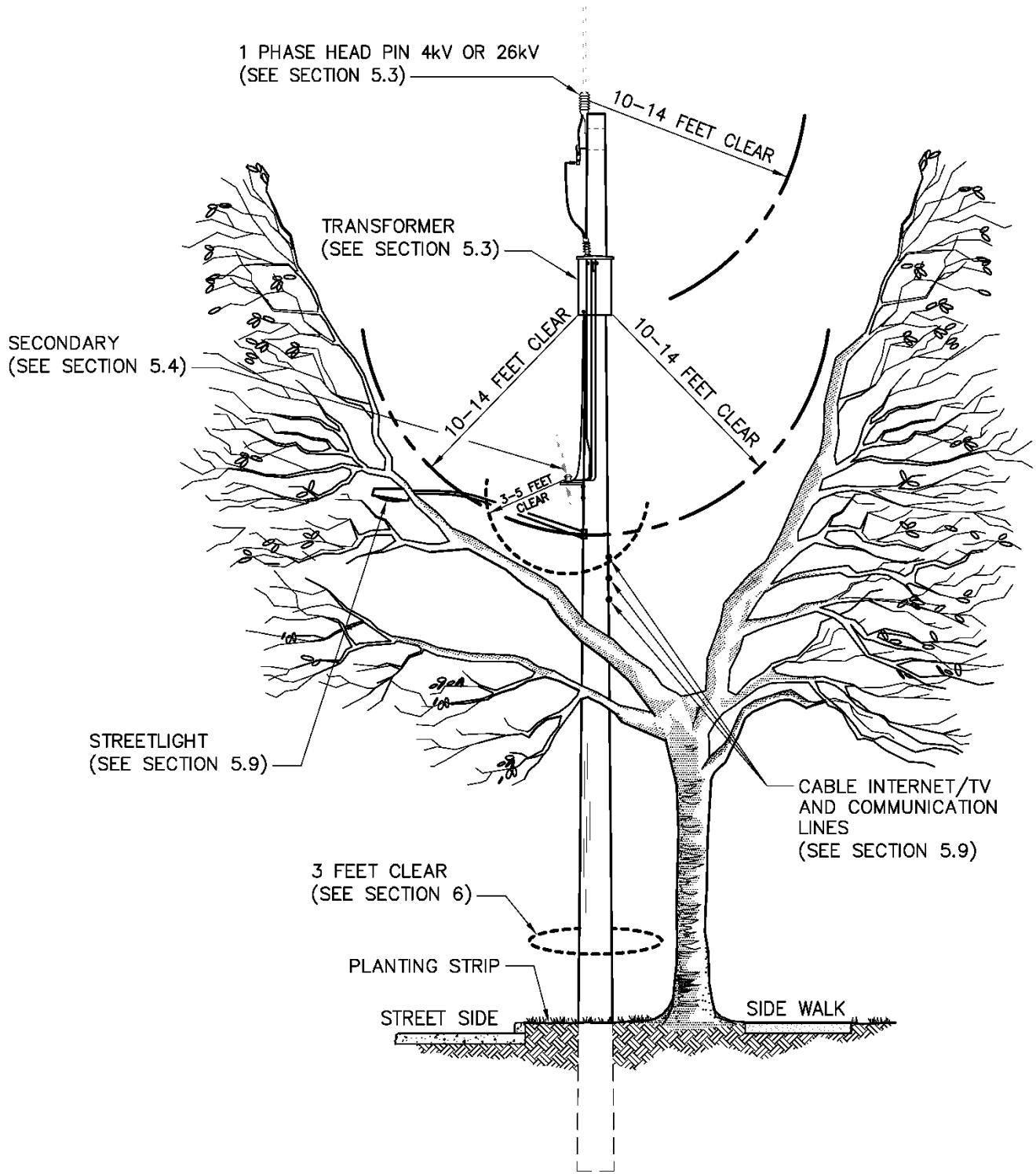


Figure 6.3 Three Phase Distribution Powerline, Heading Cut, Conifer

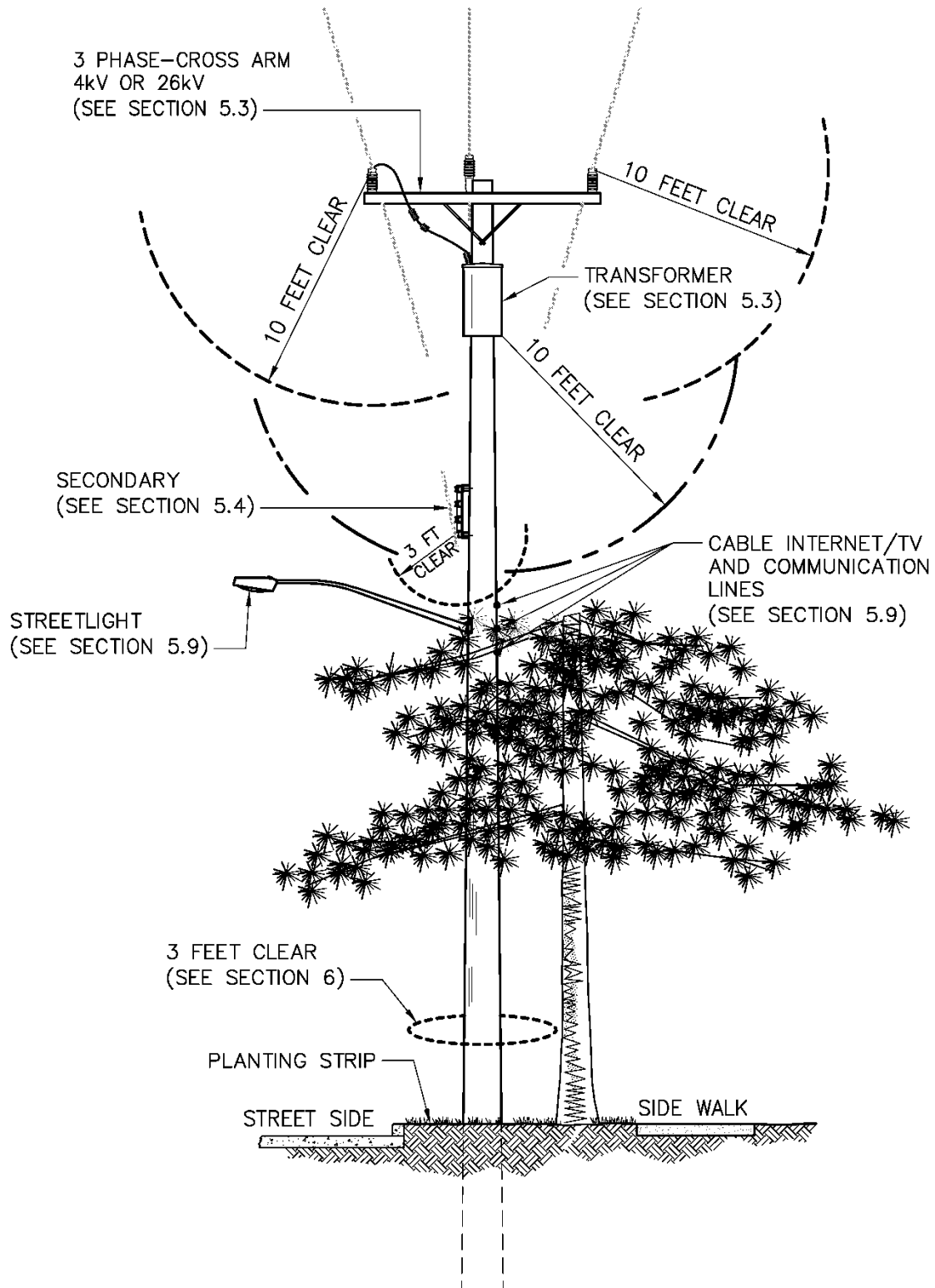


Figure 6.4 Three Phase Distribution Powerline, Side Pruning, Conifer

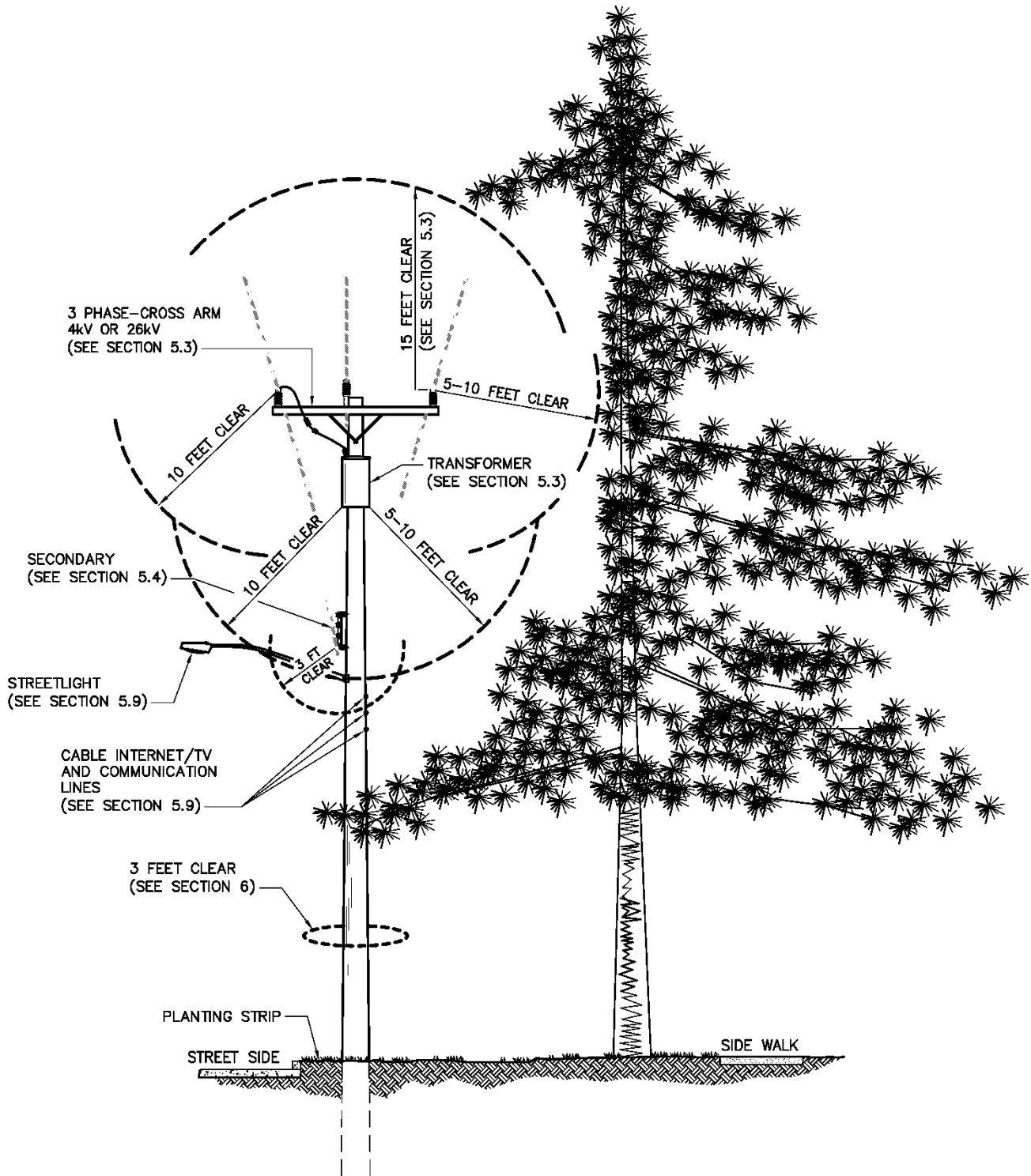
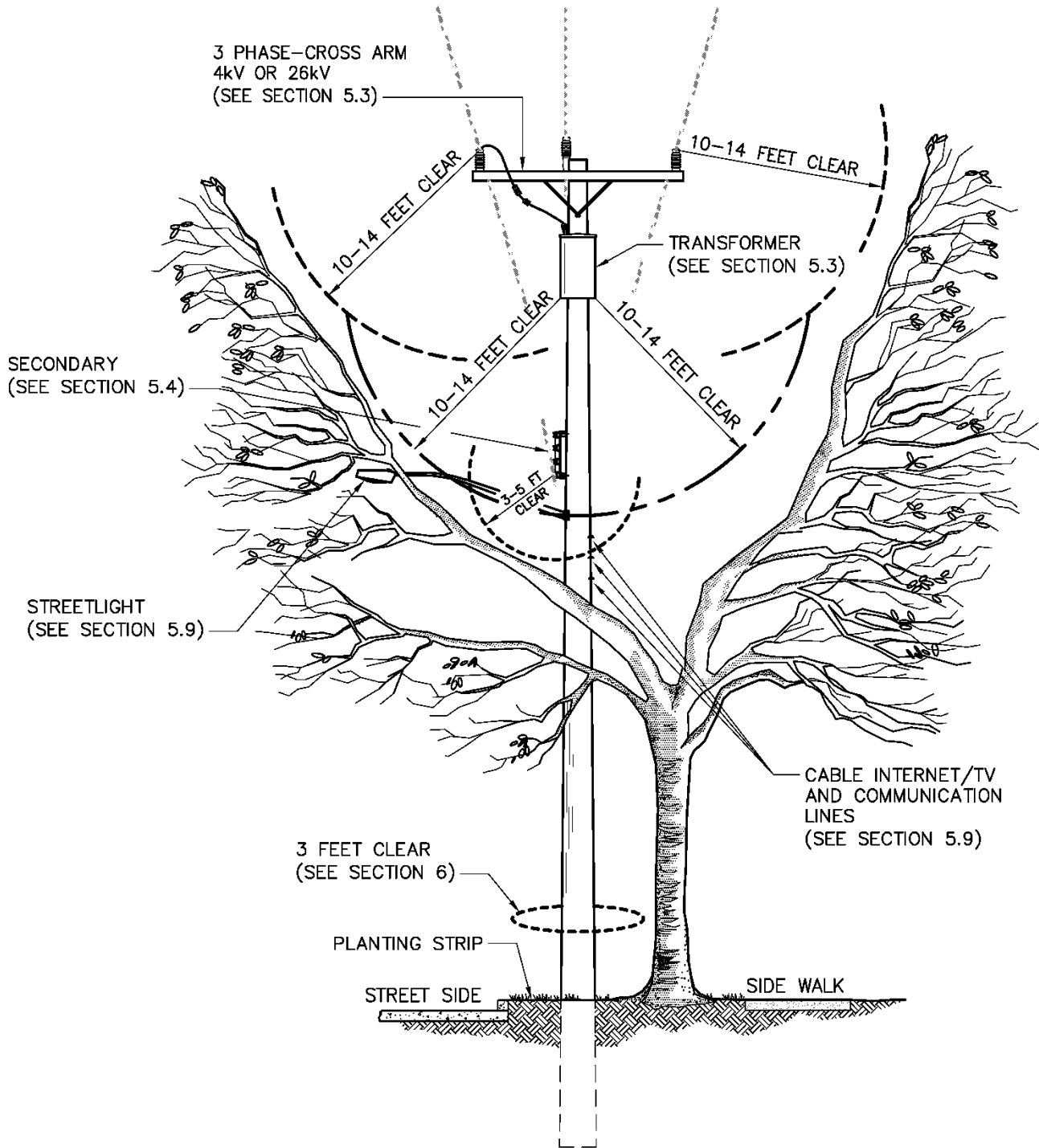


Figure 6.5 Three Phase Distribution Powerline, Directional Pruning, Deciduous



7. Methods

Power line clearance qualified tree professionals shall follow:

- ANSI A300 (Part 1) Tree, Shrub, and Other Woody Plant Management – Standard Practices (Pruning), 2017
- ANSI Z133 – 2017 – Safety Requirements for Arboricultural Operations
- Best Management Practices – ISA Utility Pruning of Trees

These standards shall apply for all tree work and vegetation management.

No established scaffold branches shall be removed from trees without prior approval by an SCL Arboriculturist, Vegetation Management Supervisor, or Power Line Clearance Supervisor.

8. References

ANSI A300 Pruning Standard (Part 1); “Tree, Shrub, and Other Woody Plant Management – Standard Practices (Pruning)”; 2017

ANSI Z133 – 2017; “Safety Requirements for Arboricultural Operations”

Kempton, Geoffrey; “Best Management Practices – ISA Utility Pruning of Trees”; 2004

9. Sources

International Society of Arboriculture

Koyama, Tina; “A street in the Wedgwood neighborhood”; original artwork for iconic image, used with permission of the artist: <http://tina-koyama.blogspot.com/>

Mutchler, David; Vegetation Management Supervisor, subject matter expert for 0114.07

RCW 64.12.035 Revised Code of Washington, Cutting or Removing Vegetation – Electric Utility – Liability – Definitions

SCL Construction Guideline D9-80 (canceled); “Tree Clearances”

The Arbor Day Foundation; Figure 3a, “Branch Collar.” Drawing adapted from original Arbor Day Foundation graphic titled “Proper Pruning Principles”, used with permission

WAC 296-24-906; ANSI Z133 2017; NESC Rule 218