



**Citizen Advisory Committee
To the Spokane Urban Forestry Tree Committee**

In-person: Tribal conference room 1st floor
City Hall, 808 W. Spokane Falls Blvd. Spokane, WA 99201

WebEx virtual meeting:

Call-in: 408-418-9388; Access code: 2489 269 8954

November 2022 meeting: November 1, 2022 at 3:00 PM

The meeting of the City of Spokane Park Board Citizen Advisory Committee will be held in-person in the Tribal conference room, 1st floor lobby City Hall, 808 W. Spokane Falls Blvd. and virtually via WebEx at 3 p.m. Tuesday, November 1, 2022. Committee members, staff, presenters and the public still have the option to participate virtually via WebEx during all meetings.

The public may listen to the meeting by calling 408-418-9388 and entering access code 2489 269 8954 when prompted.

Written public comment may be submitted via email or mail. Comments must be received no later than 11 a.m. November 1 by email to: spokaneparks@spokanecity.org or mail to: Spokane Park Board Urban Forestry Tree Committee, 5th floor City Hall, 808 West Spokane Falls Blvd., Spokane, Washington 99201. Submitted public comments will be presented to committee members prior to the meeting.

MEETING AGENDA

CALL TO ORDER

ROLL CALL

APPROVAL OF LAST MEETING'S MINUTES

CEREMONIES, APPOINTMENTS, ANNOUNCEMENTS

- Current Openings

PUBLIC COMMENT

COMMITTEE AND REPORTS

- Community Assembly
- Staff Report

OLD BUSINESS

- Watering trees educational messaging – brief update – [Spokane Tree Watering Quick Guide](#)
- Arboricultural Specifications and Standards update – review / provide comments - [Spokane Arboricultural Specifications Revised Draft](#)

NEW BUSINESS

- Other program ideas

ADJOURNMENT

Agenda Subject to Change

AMERICANS WITH DISABILITIES ACT (ADA) INFORMATION: The City of Spokane is committed to providing equal access to its facilities, programs and services for persons with disabilities. Individuals requesting reasonable accommodations or further information may call, write, or email Human Resources at 509.625.6237, 808 W. Spokane Falls Blvd, Spokane, WA, 99201; or mpiccolo@spokanecity.org. Persons who are deaf or hard of hearing may contact Human Resources through the Washington Relay Service at 7-1-1. Please contact us forty-eight (48) hours before the meeting date.

Spokane Tree Watering Quick Guide

TREES absorb water because they need it to live and grow. On warm or hot days, trees lose more water than usual through their leaves. This helps cool the tree and the environment. As surprising as it may be, a large tree may over a hundred of gallons of water a day in the summertime.

And to make things more complicated, Spokane has a "high desert" environment where trees require extra care. Our trees may need to be watered for their whole lives, especially during the hottest parts of the year. This pamphlet will discuss the proper watering of trees in and around Spokane.

Watering Basics. The most critical factor in the establishment and survival of young trees is proper watering.

A lack of water will cause drought stress, weakening the tree and making it susceptible to insects and disease. Lack of water can also cause young roots to die. The tree will not recover quickly when roots die, even if water becomes available. Prolonged drought may cause the tree to die.

For a quick check on younger trees (1-3 years), when the soil feels dry an inch below the surface - it is time to water. Too much water can be as bad as too little. Tree roots need oxygen. Little oxygen is available when the tree's root zone is saturated with water. As a result, roots may rot and die. When roots die, the tree may appear drought stressed, causing people to assume the tree needs more water, leading to overwatering.

Note: find simple canopy-dripline graphic.

How Do I Know When to Water?

Here is an easy way to test the moisture level of your soil.

- Go to a spot about half-way between the trunk of the tree and the dripline.
- Insert a garden trowel approximately 4 inches into the soil.
- Withdraw the trowel and insert your hand or fingers into the opening you just made.
- When you remove your fingers, soil sticking to them indicates moisture, meaning you don't need to water yet.

- If your fingers come out relatively clean, or if the soil feels dry, it's time to water.

How Often Should I Water? Establishing a basic watering routine is one key to a healthy tree. Let's look at the primary growth stages of a tree.

- **Newly planted.** After a tree is planted, water the root zone to eliminate air pockets.

Once planted, keep the soil moist but not soaked. Start with five gallons of water per inch of trunk diameter per week and adjust as needed to keep the soil evenly moist.

Water trees at least once a week, barring rain, and more frequently during hot weather (but remember not to over water.)

Mulching newly established trees helps prevent moisture loss. For more information on proper mulching refer to the City of Spokane "Tree Stewardship Guide." (Referenced below.)

- **Planted, 1-3 years old.** Young trees should be watered deeply once or twice a week. Establishing a regular weekly watering schedule, such as the five gallons of water per inch of trunk diameter (above), is a good start.
- **After 3 years.** Stick with your weekly watering schedule, increasing water amounts as the tree trunk diameter grows. However, keep in mind that once the tree has become established, it can survive somewhat longer periods without water. The soil around large trees can be allowed to dry to two inches deep before the tree requires watering again.

Next, let's talk about proper watering technique.

Distance From Tree for Watering. Target watering to the tree root zone. Here are some tips to help find the root zone.

- For newly planted trees, the best way to focus water on a young tree's root ball is to form a small temporary watering well around the tree, about 3-4 feet in diameter and about 4-6 inches high. (See diagram #.)
- For young trees, 2-3 years after planting, extend the watering zone to the dripline. (See diagram #.)

- For an established tree (3+ years), picture a wine glass on a dinner plate. The wine glass is the tree above ground. The dinner plate is the root system - much broader and shallower than people think. Most roots are in the top two feet of soil.

A hose, soaker hose, drip heads, or other sprinklers may be used to water the tree.

Water the roots, but not the trunk of the tree. Remember to keep an eye on watering duration. Infrequent deep watering to wet the entire root zone is best for the tree. Frequent watering leads to shallow roots, which dry out more quickly. In summer heat, water at the coolest times of day, preferably in the early morning.

Seasonality. Tree water needs vary by season. In Spokane, the growing season may vary from one year to another. Generally speaking, the growing season stretches from April to late October. Some years, a late or early winter may impact this timeline.

- **Spring:** Trees may not need additional water during a rainy spring. Use the soil moisture test (above) and water if dry.
 - Trees near house foundations, under eaves, or other coverings get little water from precipitation, so keep an eye on them.
- **Summer:** Trees need additional water during the long, hot summers of Eastern Washington.
 - Trees with southern, southwestern, or western exposures often show more heat stress and must be watered more frequently.
 - Reflected heat from housing walls, driveways, and sidewalks increases stress on trees and so trees must be watered more frequently.
 - Native trees, such as Ponderosa pine or Douglas fir, that have been in the ground a few years may need less frequent watering.
- **Fall:** Continue watering until mid-fall. Taper down as lower temperatures arrive.
- **Winter:** Trees, especially evergreens, continue to use some water throughout the winter.
 - Watering trees late into the fall will help prevent winter water stress. However, when heavy rains or snow soak the ground, stop watering.

Soils. Soil texture describes the type of soil you have, and the degree to which it is made up of clay, silt, or sand. These types of soil have different properties.

Sand feels gritty in your hand. Sandy soils have lots of space for air and water, but don't retain water well.

Silt might feel like baking flour in your hand. Silt is better at holding water than sand, and also has good space for air and water to enter the soil.

Clay soil particles stick to water, each other, and your hand extremely well. They hold water longer than silt or sand. However, clay soils are vulnerable to compaction and to becoming waterlogged. For this reason, trees may not grow as well in soils high in clay.

Loam is a good mix of sand, silt, and clay. Loamy soils combine the advantages of all three soils mentioned above while minimizing their disadvantages. Loamy soils are ideal for tree growth.

For access to the City of Spokane "Tree Stewardship Guide" go here:

<https://static.spokanecity.org/documents/urbanforestry/treefacts/tree-stewardship-guide-2022-06-01.pdf>

For more information, please visit <https://my.spokanecity.org/urbanforestry/>

Vers 1.0

Additional material

(Topic area)

(Topic area)

(Topic area)

(Topic area)

City of Spokane

Arboricultural Manual: Specifications and Standards of Practice for the City of Spokane

2019

DRAFT - July 25.2019

Prepared for:

City of Spokane Parks and
Recreation

Urban Forestry Program

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Table of Contents

Section 1. Introduction	3
Section 2. Areas of Responsibility and General Requirements.....	3
Section 3. Tree Planting, Pruning, and Removal	4
3.1 Worksite Requirements	4
3.1.1 Street Closure and Traffic Control.....	4
3.1.2 Site Cleanup	4
3.1.3 Protection of Property	4
3.1.4 Protection of Overhead Utilities	5
3.2 Tree Planting	5
3.2.1 Tree Planting Criteria	5
3.2.2 Tree Planting Permits.....	6
3.2.3 Plant Material	6
3.2.4 Tree Planting Specifications and Standards	6
3.2.4.A Location Requirement	6
3.2.4.B Balled and burlapped (B&B) Tree Installation	6
3.2.4.C Transportation, storage and handling of plant material.....	7
3.2.4.D Tree planting operations	7
3.2.4.E Inspection and acceptance.....	8
3.3. Tree Pruning	8
3.3.1 General Pruning Criteria.....	9
3.3.2 Tree Pruning Permits	9
3.3.3 Pruning Specifications and Standards.....	9
3.3.4 General Procedures for Tree Pruning.....	10
3.3.4.A Specific procedures for young trees	10
3.3.4.B Specific Procedures for Medium to Mature Age Trees.....	10
3.3.4.C Restoration Pruning	11
3.4. Tree Removal	12
3.4.1. Removal Criteria	12
3.4.2. Tree Removal Permits.....	12
3.4.3. Removal Specifications and Standards	13

3.4.4. Creation of Wildlife Snags	13
3.5. Other Maintenance Specifications and Standards	14
Section 4. Street Tree and Park Design	15
Section 5. Spacing, Location and Tree Selection Requirements	15
Section 6. Tree Preservation During Construction and Development	17
6.1. Introduction	17
6.2. Tree Protection Specifications and Standards	17
6.2.1. Tree Inventory	17
6.2.2. Tree Protection Plan	17
Section 7. Glossary	19
Section 8. Appendices	24
A. Pruning Techniques	24
B. Planting Techniques	25
C. Tree Protection Zone	27
Section 9. Additional Resources	28

Section 1. Introduction

This document contains the regulations and standards for the removal, pruning, root pruning, planting, and other maintenance of trees. It applies to trees on public property and street rights-of-way. The purpose of the manual is to provide a detailed guide to approved Best Management Practices (BMP) in arboriculture for developing and improving the tree resources in the city. The manual is intended as a reference primarily for arborists, engineers, landscape architects, landscape contractors, and urban planners to ensure compliance with the City of Spokane urban forestry ordinance (Spokane Municipal Code section 12.02.900). Secondly, it is for property owners performing minor pruning; the Spokane Tree Stewardship Guide is also a helpful resource for homeowners.

Section 2. Areas of Responsibility and General Requirements

Spokane Municipal Code 12.02.900 provides the legal basis for the development of an Arboricultural Specifications and Standards Manual for the proper care of trees in our urban forest. The ordinance places the supervisory responsibility of managing trees in public rights-of-way and other public places under the Parks and Recreation Division. Additionally, the ordinance establishes the maintenance responsibilities of the abutting property owner. The management of the urban forest is a cooperative responsibility of public and private owners. It involves a combination of property owners, the Urban Forestry Program, commercial tree services, public utilities, tree nurseries and other city departments in a systematic maintenance program that considers the needs of individual trees and the urban forest as a whole.

These specifications and standards serve as principles for the proper care of all public trees. They will apply regardless as to whether the work is performed by city staff, or commercial tree services or property owners. The Arboricultural Specifications and Standards Manual shall be adhered to at all times but may be amended by the director of Parks and Recreation at any time that experience, new research or laws indicate improved methods, or other circumstances that make it advisable. Exceptions to the specifications and standards manual must be by written approval of the Parks and Recreation Director or designee.

It is the responsibility of the abutting property owner to protect the health of the street trees(s) through compliance with Spokane Municipal Code. Tree care performed directly by the abutting property owner or through a hired arborist contractor or commercial tree service shall comply with the guidelines herein.

Section 3. Tree Planting, Pruning, and Removal

3.1 Worksite Requirements

3.1.1 Street Closure and Traffic Control

- a. Blocking of public streets shall not be permitted without prior approval by the City of Spokane. The permit holder is obligated to notify homeowners in writing in work area prior to commencing work. The permit holder is responsible for having the vehicles moved during arboriculture work.
- b. The permit holder shall provide adequate barricades, certified flagger(s), signs and/or warning devices during the performance of the tree work to protect workers, motorists and pedestrians. All placements of traffic control devices (cones, signs, barricades etc.) must conform to the American Traffic Safety Standards. Refer to [SMC 12.02.074 \(Traffic Regulation\)](#) for minimum code requirements. Yellow flashing lights mounted on a vehicle shall not be deemed as sufficient for traffic control. Obstruction Permits are required for any work within the public right-of-way.

Questions may be directed to the [Public Works Permit Coordinator](#).

3.1.2 Site Cleanup

- a. The permit holder shall clean up the site and remove and dispose of all debris at the end of each day's operation. Site cleanup shall include removal of all debris from the street, curb, parkway, sidewalk, private lawns, and driveways. Exceptions are allowed for private property owners that have specifically requested in writing to leave wood or chips. If the private property owner requests wood or chips, these shall be left on private property, and not the right-of-way. The permit holder is responsible for disposing of debris according with disposal regulations of the City of Spokane, Spokane County, and the State of Washington. The site shall be returned to the condition prior to work.
- b. Limbs and trunks temporarily placed in the right-of-way areas shall be placed in such a manner as to eliminate any obstruction to motor vehicles and pedestrians. Brush and limbs overhanging a curb or pavement shall not be acceptable. Under no circumstances shall these materials be allowed to remain in the right-of-way or in a park overnight.
- c. All infectious diseased trees or parts possibly harboring disease vectors or invasive pests shall be removed and disposed of according to City, County, and State regulations, and may not be left for property owners. The City Arborist or their agent will determine the current list of infectious diseases, vectors, and invasive pests.

3.1.3 Protection of Property

- a. The permit holder shall take all necessary precautions to eliminate damage to adjacent trees and shrubs, lawns, curbs, walks, and any and all other real or public

property. Holes made in lawns shall be filled with native topsoil and seeded with a turf grass lawn seed mix unless specified otherwise by the property owner.

- b. Equipment shall not enter private property without written permission from the property owner.
- c. Vegetation surrounding trees should be disturbed as little as possible during tree work.
- d. Sidewalks, curbs, streets, irrigation heads, and manhole structures shall always be protected from the impact of falling wood by the use of supports, ropes, or mechanical devices. Ropes or other mechanical devices shall be used to lower all limbs of sufficient size that may cause damage to other trees or surrounding public or private property.

3.1.4 Protection of Overhead Utilities

- a. Pruning operations may be conducted in areas where overhead electric, telephone, and cable television facilities exist. The permit holder shall protect all utilities from damage, shall immediately contact the appropriate utility if damage should occur, and shall be responsible for all claims for damage due to tree work operations.
- b. The permit holder shall make arrangements with the utility company for removal of all limbs and branches that may conflict with or create a hazard in conducting pruning operations. If limbs are within ten feet (10') of power lines, a safety prune must be conducted by the utility company prior to any tree work.

3.2 Tree Planting

A beautiful, healthy tree adds environmental, economic, and social value to the community. Trees are a critical element of urban infrastructure, providing shade, energy conservation, erosion control, clean air, urban wildlife habitat, and abating noise and wind. Choosing the right tree and the right place helps ensure beautiful, healthy trees that require less maintenance, and avoids future site conflicts.

3.2.1 Tree Planting Criteria

The City Urban Forester or designee may authorize or require tree planting whenever a public tree is removed, when a vacant site is identified, or as part of a community tree planting plan. Tree species and location selection will consider the following factors:

- a. Mature height, width, and habit of the tree
- b. Visibility and clearance near driveways, intersections, traffic signs, and signals
- c. Future conflicts with overhead and underground utilities
- d. Soil space for roots and potential conflicts with sidewalks, driveways, streets, curbs, sewer, septic systems, and other infrastructure
- e. Cultural requirements of the species including cold-hardiness, light, soil, wind and water

- f. Susceptibility to current and emerging urban forest disease or insect pests
- g. Current and future site uses
- h. Wildlife habitat, food, and usage
- i. Adaptability to current and forecasted climate
- j. Seasonal features such as flowers and fall color
- k. Fruit type and abundance

3.2.2 Tree Planting Permits

Permits are required to plant any tree within the public rights-of-way. Permit applications are obtained online (<https://my.spokanecity.org/urbanforestry/permits/>) or at the Development Services Center. A permit is required for each work site address. All worksites are subject to pre and post inspection of the site and work procedures.

Street tree planting by abutting property owners at residential locations is allowed, with city arborist technical assistance and approval.

3.2.3 Plant Material

- a. Plant material shall not be less than two (2") inches in diameter measured at six (6") inches above the ground unless a size variance is authorized by written request to the City Urban Forester. Plant material shall conform with and meet American standards for Nursery Stock, ANSI z60.1-(current version) or as amended and the Standardized Plant Names adopted by the American Joint Committee on Horticulture Nomenclature.
- b. Plant material may be balled and burlapped, containerized or bare root. A list of Approved Street Trees and their general characteristics is available at www.SpokaneUrbanForestry.org.

3.2.4 Tree Planting Specifications and Standards

3.2.4.A Location Requirement

Trees must meet the location requirements of Design Standards 3.5–2. Trees should be planted at sites that meet the following criteria:

- a. A minimum distance of fifteen (15') feet from driveways
- b. A minimum distance of ten (10') feet from drainage inlets
- c. A minimum of twenty (20') feet from drywells
- d. Without obstructing traffic signs or sight triangles
- e. A minimum of fifteen (15') feet from underground utilities

3.2.4.B Balled and Burlapped (B&B) Tree Installation

For tree installation specifications refer to [City of Spokane Standard Plans, Landscaping Sections V-101 and 102](#) for complete diagrams and details on tree and shrub planting. Trees not planted in conformity with these standards will be rejected. Corrections may be made for proper planting.

In some circumstances replacement of rejected trees may be required. Replacement will be done at the contractor's expense and not by the City of Spokane.

- a. Protection of existing features. During planting, protect all existing trees, shrubs and other vegetation, site features, improvements, structures and utilities specified herein and /or on submitted drawings, specifically authorized by the owner.
- b. Applicable specifications and standards. Best Management Practices - Tree Planting, Second Edition by Gary Watson and American National Standard for Tree Care Operations—Standard Practices (Planting and Transplanting) 2012, and the [City of Spokane Standard Plans, Landscaping Sections V-101 and 102](#).
- c. Accessories and soil amendments shall be applied:
 - i. Bark mulch: Wood chip mulch, shredded medium grind size. Mulch should be free from noxious weed seed, debris, and all foreign material.

3.2.4.C Transportation, storage and handling of plant material.

- a. Cover plants transported on open vehicles with a protective covering to prevent wind burn. Plants shall not be bound with wire or rope at any time so as to damage the bark or break branches.
- b. Handle plants with care and protect plants from injury. Plants shall be lifted and handled with suitable support of the soil ball to avoid damaging it.
- c. Protect all plant from drying out. Should roots or root balls be dried out, large branches broken, soil balls broken or loosened, or areas of bark torn, the city may reject the injured tree(s) and require replacement trees by the permit holder.
- d. Plants, once removed from the holding medium, must be planted immediately.

3.2.4.D Tree planting operations

- a. During and immediately following planting, the work area should be kept clean and avoid obstructing normal traffic. Obstruction Permits are required for any and all work within the public right-of-way. General site cleanup applies.
- b. Excavate a hole 3X diameter of the root ball. Subgrade under root ball should be kept undisturbed to reduce settling.
- c. Protect the plant during planting:
 - Keep roots moist and protected from drying winds
 - Protect against damage to stems and branches
 - Avoid lifting trees by the trunk
- d. Set the plant in the hole:
 - Remove any container, wire baskets, and burlap completely from root ball.
 - Remove all trunk wrap, labels, tags, bamboo stakes or other foreign objects.

- At the time of planting prune only dead, broken, and double leader branches.
 - Remove excess soil from root ball as required to expose original root flare.
 - All 'adventitious roots', 'stem girdling roots' and 'suckers' shall be pruned away prior to planting.
- e. Backfill and water the new planting:
- Break down sides of hole when backfilling.
 - Finished grade will result in the root flare one (1") inch to two (2") inches above the finished grade. Trees buried too deep or without exposing root flare will be rejected and shall be replanted at the proper depth.
 - Backfill with existing soil, do not tamp, water thoroughly.
- f. Mulching:
- Apply three to four (3-4") inches woody mulch at a minimum of 60 inches in diameter, keeping mulch at least three (3") inches from the trunk.
- g. Staking:
- After planting, if trees are unstable staking may be used but only as necessary.
 - Staking material must be removed at six (6) months after planting
 - If tree is still unstable after six (6) months, tree may need to be replaced

3.2.4.E Inspection and acceptance

- a. Planted areas will be inspected at completion of installation and accepted subject to compliance with specified materials and installation requirements. To be acceptable, plants shall be in compliance with all planting specifications according to [City of Spokane Standard Plans, Landscaping Sections V-101 and 102](#) or the permit holder will be required to remove and replant.
- b. The property owner will assume plant maintenance.

3.3. Tree Pruning

Pruning of trees is intentionally and permanently injuring a tree to meet a management objective in the landscape. In the public rights-of-way, pruning is permitted to improve tree structure, remove deadwood, and provide clearance and visibility that improve public access and safety. All tree pruning shall adhere to the ANSI A300 Standards for Pruning and will be enforced according to Spokane Municipal Ordinance 12.02.900. Pruning of public trees and street trees must meet standards and be conducted under permit.

3.3.1 General Pruning Criteria

The Urban Forester or designee may prune or authorize at their discretion, the pruning of trees in city rights-of-way and on public property in accordance with criteria listed in section 12.02.965 of the urban forestry program ordinance, or when one (1) of the following criteria is met:

- a. Any tree that presents an unacceptable risk due to structure, or disease
- b. Any tree that obstructs a clear view of streets, critical public safety signs, traffic signals, streetlights, intersections, or interferes with the safe use of the street or sidewalk
- c. Any tree that does not meet an eight-foot (8') clearance over sidewalks and a fourteen-foot (14') clearance over streets
- d. Any tree that is now or anticipated to be damaging public improvements or public utilities
- e. Any tree that is designated as part of a scheduled city pruning program
- f. Any tree on private property that overhangs the public rights-of-way and interferes with established criteria

3.3.2 Tree Pruning Permits

Permits are required by commercial tree services for pruning of any tree within the public rights-of-way or on public property regardless if the work is considered major or minor pruning. The applicant must be licensed, bonded, and insured, and possess a current valid Commercial Tree License in order to obtain a permit. Commercial Tree License requirements are outlined in [Spokane Municipal Code section 10.25.010](#).

International Society of Arboriculture certified arborists or certified tree workers must perform work which involves tree climbing or tree pruning, planting, or removal.

A permit is required for each work site address. All work sites are subject to pre and post inspections of the work site and work procedures.

A permit is not required by property owners who may conduct minor pruning of branches according to the following criteria:

- a. Branches being pruned do not exceed two (2") inches in diameter
- b. Pruning does not exceed 15% canopy loss
- c. The tree is more than ten (10') feet from a power line
- d. Pruning must be done in accordance with specifications and standards

3.3.3 Pruning Specifications and Standards

- a. All pruning activity must be in accordance with ANSI Standard A300 (Part 1-Pruning).
- b. All equipment to be used and all work to be performed must be in accordance with the most current revision of the ANSI Standard Z133.1-2000 and A300-200 or as amended.
- c. Pruning cuts shall be made outside the branch collar, avoiding flush cuts and stub cuts.

- d. Pruning tools shall be sharpened regularly to create clean cut margins.
- e. On trees known to have diseases, tools are to be disinfected with methyl alcohol at 70% (isopropyl alcohol diluted appropriately with water) or 10% bleach solution after each cut and between trees where there is known danger of transmitting the disease on tools.
- f. Care shall be taken to avoid unnecessary damage to the bark and cambium layer from rigging equipment. Ropes shall not come into direct contact with the crotch or other parts of the tree being retained or tied to the tree limb. Friction or cambium savers are to be used when accessing and rigging.
- g. Climbing spurs shall not be used in pruning operations except to perform an aerial rescue of an injured worker.
- h. If dropping limbs may cause damage to other trees or surrounding property, mechanical rigging techniques shall be used.

3.3.4 General Procedures for Tree Pruning

- a. Dead branches greater than half-an-inch (0.5") measured at the base of the branch should be removed from the canopy of all trees being pruned.
- b. Remove no more than 20% of the tree's live tissue during any one (1) calendar year.

3.3.4.A Specific procedures for young trees

Young trees are typically less than 10 years old or are 2-3 years from the nursery. The primary purpose of pruning young trees is to improve the trunk and branch structure. Properly trained young trees will develop into structurally strong mature trees. The greatest pruning objective with young trees is the establishment of a central leader. When young tree pruning may be necessary, the following additional standards shall apply:

- a. Remove dead, dying, damaged, diseased branches.
- b. Select and establish one branch as the central leader.
- c. Select the lowest permanent branch based on tree location/purpose.
- d. Select and establish scaffold branches.
- e. Select temporary branches below the lowest permanent branch to limit canopy loss to <20%, then remove or prune other branches.

3.3.4.B Specific Procedures for Medium to Mature Age Trees

These trees will have larger limbs and tree scaffold structure. When medium to mature tree pruning may be necessary, the following additional standards shall apply:

- a. The weight on main scaffold limbs with included bark shall be reduced by approximately one-third ($\frac{1}{3}$) by removing some secondary branches toward the end of the limbs and/or removing the end of the branch using a reduction cut.
- b. If a tree divides into two (2) or more codominant leaders of equal size in the bottom two-thirds ($\frac{2}{3}$) of the tree, a dominant leader shall be selected. Reduce the end weight of all other codominant branches by approximately one-third ($\frac{1}{3}$) using

reduction and thinning cuts. Reduction should be accomplished by removing the main portion of the codominant leaders growing upright or toward the center and leaving those branches that are oriented outward. Use mostly thinning cuts, not drop-crotch cuts, on larger branches and trees. (Note: On some trees, you may not be able to perform all of this because you cannot remove more than 20% of the foliage. Make a note of this tree and report to the City Arborist.)

- c. Identify those trees that have included bark in the crotches between codominant stems. Make a note of these on the inventory list. The City Arborist or designee will evaluate these trunks with vertical cracks or other potentially hazardous conditions. The presence of any structural problem, disease, insect pest or decay should be reported in writing to the City Urban Forester.

3.3.4.C Restoration Pruning

Crown restoration is intended to improve the structure of trees that have been broken, topped or severely pruned using heading cuts. Many shoots can emerge from the cut ends (stubs) of topped or broken trees. Some shoots also develop below the cuts. These shoots are poorly attached to the tree and have a higher likelihood of breakage. The city will accept that 30% of foliage may be removed in a calendar year if necessary, for restoration pruning, however crown restoration may require several pruning cycles over a number of years to achieve restoration objectives. Where restoration pruning becomes necessary, pruning activity must be in accordance with ANSI Standard A300 (Part 1-Pruning, Annex B-3.1):

- a. Assess trees for risk if necessary, prior to beginning restoration pruning.
- b. Retain suitable leaders, branches and shoots to be developed (specify parts to retain and develop).
- c. Reduce, subordinate and/or remove competing or undesirable parts (specify parts to be removed, and types, sizes number and locations of cuts).
- d. Develop dominant leader(s) and desirable scaffold branches appropriate for the species and site (specify leaders and branches to be retained and developed).
- e. Subordinate or remove competing leaders, branches and shoots. If necessary, subordinate larger branches over multiple growing seasons to avoid making cuts with large aspect ratios and to avoid removing excessive amounts of material (specify competing leaders and branches to be subordinated or removed, and appropriate maintenance interval).

3.3.4.D Root Pruning

When the cutting of roots is required to meet specific goals or objectives, care must be taken to ensure survivability of the tree in terms of both water uptake and structural stability. In addition to observing ANSI A300 Part 8-Root Management, the following additional standards shall apply:

- a. Mechanical digging and root pruning equipment shall be maintained according to manufacturers' recommendations to minimize root damage
- b. Digging and root pruning tools shall be sharp in order to cut without breaking, crushing or tearing roots.
- c. Expose the roots of the impacted tree with an air/hydro excavation tool or through hand digging.

- d. Where excavation is required, protect any exposed roots from desiccation and damage until the excavation has been completed and the roots are ready to be covered by soil.
- e. Pruning of all roots shall be supervised by a City-licensed Commercial ISA Certified Arborist to ensure the overall structural stability of the tree has been confirmed.

3.4. Tree Removal

This section describes the standards and expectations of the city for activities associated with tree removal. In addition, any activity that causes a tree's condition to become critical or dead shall be considered tree removal and standards herein shall apply.

3.4.1. Removal Criteria

The Urban Forester or their agent may authorize removal, or remove trees situated within the rights-of-way, or approve a permit for removal by a third party. Mitigation options besides removal shall be considered before removal is authorized. Trees will be authorized for removal whenever one (1) or more of the criteria listed in [SMC 12.02.965](#) of the urban forestry ordinance are met:

- a. The tree is hazardous as determined by [SMC 12.02.920](#).
- b. The tree is damaging public improvements or public utilities and removal is necessary because of the installation of, or potential or actual damage to, a sidewalk, parkway, curb, gutter, pavement, sewer line, underground utility or other municipal improvement.
- c. There is infection or infestation of trees or shrubs with a disease or pest detrimental to the growth, health or life of such trees and which infection or infestation cannot be controlled or removed.
- d. The vegetation obstructs rights-of-way, authorized traffic signs or is determined to interfere with line of sight or creates other identified traffic or safety concerns.
- e. The tree's health is severely degraded because of improper pruning, including severe crown reduction.

3.4.2. Tree Removal Permits

Permits are required for the removal of any trees within the public rights-of-way or on public property. The applicant must be licensed, bonded, and insured, and possess a current valid Commercial Tree License in order to obtain a permit. Commercial Tree License requirements are outlined in [Spokane Municipal Code section 10.25.010](#).

International Society of Arboriculture certified arborists or certified tree workers must perform work which involves tree climbing or tree pruning, planting, or removal.

Permit applications are submitted online through the [Development Services Permit Center](#).

Guidance for permit application submittal is available at <http://www.spokaneurbanforestry.org>. A permit is required for each work site address. All work sites are subject to pre and post inspection of the work site and work procedures.

3.4.3. Removal Specifications and Standards

- a. All equipment to be used and all work to be performed must be in accordance with the most current revision of the American National Standards Institute Standard Z-133.1 and A300 or as amended herein.
- b. Removal shall consist of cutting down each tree in a safe manner to four (4") inches above the adjacent ground level and grinding the stump and buttress roots to twelve (12") inches below or adjacent to ground level.
- c. Stump removal is required as part of the tree removal process. The permit holder shall remove all tree stumps and buttress roots to a point twelve (12") inches below the adjacent ground level. Additionally, the permit holder shall remove sufficient subsurface roots so as may be necessary to eliminate "humps" in the lawn area adjacent to the stump. The area then shall be restored with topsoil to the level of the adjoining grade and seeded unless otherwise specified by the property owner. Exceptions to this standard may be granted by the City Urban Forester or designee where stump removal can be shown to be damaging to existing trees or other infrastructure or if the stump is to remain as wildlife habitat.
- d. Removal of stump grindings and debris. In addition to general site cleanup standards; within 24 hours after grinding (removal) of a tree stump and buttress roots, the permit holder shall remove all stump grindings and associated debris from the site. Grinding debris generated by stump removal work shall be the responsibility of the permit holder. Stumps, grindings and debris shall be placed away from the curb and gutter, street and sidewalk immediately to eliminate hazards to the motoring public and pedestrians.
- e. Backfilling stump removals. All areas where stumps have been removed and areas disturbed by removal operations shall be backfilled to the level of adjoining grade with topsoil the same day grindings are removed, otherwise the site shall be properly barricaded overnight to ensure the safety of the public. All holes must be filled with topsoil by the second day. The permit holders shall supply their own topsoil. The topsoil shall be properly leveled and compacted so as to ensure a minimum amount of settlement of the backfill material. If there is more than a one-day delay between the time of removal of grindings and refilling with the soil, the disturbed areas shall be barricaded off for public safety and the Urban Forester or their designee notified. Stump grindings and debris shall not be used as backfill material. Topsoil should be native; free of roots, rocks, subsoil, debris, weed seeds, and foreign matter.
- f. Restore the site to pre-existing site conditions. This may require applying grass seed mix in areas where backfill material was installed. Seeding operations shall occur after April 15th and before October 1st.

3.4.4. Creation of Wildlife Snags

Through special approval from the City Urban Forester, the permit holder may seek to retain portions of dead trees as a wildlife snag to create wildlife habitat. Standing dead trees, called snags, provide birds and mammals with shelter to raise young and raptors with unobstructed vantage points. Large downed trees also provide important habitat for wildlife. The city will

consider requests for wildlife habitat creation only in instances where the risk to public safety is sufficiently mitigated. Abutting property owners must commit to a maintenance agreement that includes bi-annual inspections by a Commercial Licensed Tree Service.

3.5. Other Maintenance Specifications and Standards

- a. Fertilization - Tree fertilization shall be done in accordance with ANSI A300 (Part 2) - 1998 Standards and Specifications. Organic mulch is recommended. Fertilizer is only recommended if trees have signs of nutrient deficiency, soil testing may be needed to confirm the particular deficiency.
- b. Cabling and Bracing. The installation of cabling and bracing tree support systems is a specialized practice in the field of arboriculture. Proper training and field experience are necessary to perform these treatments successfully and without damaging the tree. These treatments shall be done in accordance with ANSI A300 (Part 3)-2000 standards and specifications. Other mitigation options shall be considered before consideration of hardware installation. Installation of hardware must be approved, and the abutting property owner must commit to maintenance agreement with annual inspections by a City Licensed Commercial Arborist.

Section 4. Street Tree and Park Design

The Urban Forestry Program advocates for the establishment and retention of adequate planting spaces in street and park designs that align with the urban aesthetic objectives of the community. Large trees with overhanging canopies of branches are especially desirable. In the public rights-of-way this is most commonly accomplished with pedestrian buffer strips or planting strips. Wide planting strips are important, and any street system design should provide sufficient space to accommodate large trees. Streets with tree canopies overhead provide a traffic calming effect, extend the life of roads, and provide a separation between the streets and sidewalks that improves pedestrian walkability. In parks, planting spaces are less likely to be constrained and design strategies should give priority for large stature trees.

Section 5. Spacing, Location and Tree Selection Requirements

Trees are living organisms that grow larger each year as they increase in height, crown width and root system. They require sufficient space to reach their full size without crowding buildings, sidewalks, overhead utility lines, neighboring properties and other plants. Any planting plans for trees shall consider their mature tree size and shape. Tree placement should align with site use and public safety objectives without compromising infrastructure improvements. The city has developed an approved list of street trees (Classified as I, II or III) to facilitate tree selection based on the criteria in Table 5.1. Contact the Urban Forester for consideration of genus, species, variety, or cultivar substitutions and other variance requests.

In all cases, trees shall be planted in the center of the strip between the curb and sidewalk when a detached sidewalk is present, or when sidewalk plans specify a detached sidewalk. The following table describes the general tree location, selection and placement criteria for trees in the public rights-of-way:

Approved Street Tree List, April 2019.

(<https://static.spokanecity.org/documents/urbanforestry/permits/street-tree-list-2019-04-22.pdf>)

Table 5.1: Criteria for Tree Location, Selection and Placement in the Rights-of-Way.

General Tree Location	Tree selection Criteria	Tree Placement Criteria
At the Intersection of Roadways	No plant material with a mature height greater than 36 inches and less than eight (8') feet.	No plant material shall be planted within the sight triangle along the boundary of each of the intersecting curb lines. No plant shall create a conflict with the sight obstacle triangle. [See illustrations in Appendix A]
Attached curb and sidewalk (no planting strip)	Class I, II or III according to available space.	Tree shall be placed within the public rights-of-way, but no closer than 2.5' feet behind the sidewalk. Where no public rights-of-way exists, the property owner may grant an easement to the city of Spokane for the new tree installation.
Adjacent to Curbs and Sidewalks <5 feet width)	No tree planting is permitted where the distance between a curb and detached sidewalk is less than five (5') feet.	Consider alternative placement: <ol style="list-style-type: none"> 1. Plant tree behind the sidewalk. 2. Construct an arc in the sidewalk to create a planting space. 3. Select a shrub or perennial flower species appropriate for the limited space.
Adjacent to Curbs and Sidewalks (5 feet width planting strip)	Class I Trees	Spacing between trees shall be no closer than 25 feet. Class I Trees only for locations with overhead powerlines.
Adjacent to Curbs and Sidewalks (5 to 8 feet width planting strip)	Class II Trees	Spacing between trees shall be no closer than 35 feet. Closer spacing based on species mature width may be requested.
Adjacent to Curbs and Sidewalks (>8 feet width)	Class III Trees	Spacing between trees shall be no closer than 45 feet. Closer spacing based on species mature width may be requested.
Driveways, Alleys, Streetlights, Utility Poles, Street Safety Signs, or Fire Hydrants, Drainage Inlets and Drywells.	Not applicable.	No tree or shrub shall be planted within fifteen (15') feet.
Overhead Utility Lines*	Class I Trees	25' spacing

**Placement and spacing variances may be considered by the Urban Forester upon written request*

Section 6. Tree Preservation During Construction and Development

6.1. Introduction

Construction damage during development is a common and preventable cause of tree death and decline in urban areas. It is possible to preserve trees on construction sites if the correct measures are taken. The most important step is to be sure that an ISA Certified Arborist is involved early in the project - during the planning stages. Decisions to preserve and remove specific trees can be discussed and determined at the same time as decisions about site layout, grading requirements, and construction techniques. Unhealthy and structurally deficient trees may not be worth protecting and their removal may improve the health and structure of the remaining trees.

The fundamental objective behind tree protection during construction is to minimize damage to a trees Critical Root Zone (CRZ). This is achieved through the correct installation of a Tree Protection Zone (TPZ) and implementation of Best Management Practices for tree care. The standards described in this section provide the minimum criteria necessary for project approval.

6.2. Tree Protection Specifications and Standards

Tree preservation efforts shall comply with sections 12.02.970 and 12.02.975 of Spokane Municipal Code. Projects shall have a tree inspection and inventory as well as a tree protection plan. The City Urban Forester shall review all projects involving tree(s) on public property when the project is conceived and continue through the planning, design, construction and maintenance phases.

6.2.1. Tree Inventory

The inventory shall be completed by an ISA Certified Arborist. The tree inventory shall include but is not limited to the following information:

- a. The species, location, general condition, average canopy radius, DBH, and height of all trees on the site.
- b. The species, location, general condition, average canopy radius, DBH, and height of all plants which have canopies extending into the project site with a DBH \geq 4 inches.
- c. A preservation priority shall be determined for each tree based on tree condition, species and other values.
- d. Reasons for removal where applicable.
- e. Any priority maintenance required prior to construction.

6.2.2. Tree Protection Plan

From the information provided in the tree inventory, a Tree Protection Plan (TPP) shall be completed for the project by a qualified arborist containing the following:

- a. A numbering system of all existing trees, which meet the collection threshold.
- b. Proposed tree status for each tree retained or proposed for removal.
- c. A brief general health or condition rating of each tree (i.e. poor, fair, good, etc.)
- d. A description of each tree's diameter, species and canopy spread.
- e. Criteria for determining the Critical Root Zone (CRZ) and specific instructions for any project activity proposed within the CRZ.
- f. A detailed description of the timing, construction, and installation of the Tree Protection Zone (TPZ).
 1. The TPZ should be installed at the CRZ or dripline of the tree, whichever is greater. Where excavation and root pruning is necessary for project objectives, the TPZ fencing may be installed closer to the trunk and will need to be determined by the site arborist at the time of installation.
 2. TPZ fencing shall be a minimum of 4 feet high, constructed of chain link or polyethylene laminar safety fencing or similar material subject to approval by a Certified Arborist.
 3. "Tree Protection Area - Keep Out" or similar signs shall accompany the TPZ fencing at regular intervals with contact information for the site arborist easily visible.
 4. TPZs shall be constructed in such a fashion as to not be easily moved or dismantled.
 5. TPZs shall remain in place for the entirety of the project and only removed, temporarily or otherwise, by an ISA Certified Arborist after submittal and approval of intent.
- g. For trees not viable for retention, a description of the reason(s) for removal based on poor health, high risk of failure due to structure, defects, unavoidable isolation or unsuitability or species, etc., and for which no reasonable alternative action is possible must be given (pruning, cabling, etc.).
- h. Describe the impact of necessary tree removal to the remaining trees, including those in a grove or on adjacent properties.
- i. A discussion on monitoring and follow up inspections to check on tree retention and preservation recommendations

Section 7. Glossary

ANSI A300 standards - Standards developed by the American National Standards Institute regarding the practice of tree care.

ANSI Z133.1 - Safety standards developed by the American National Standards Institute for tree care operations.

Air-spade(ing) - Equipment providing a jet of compressed air to a hand-held device which helps to excavate roots almost non-destructively.

Apical Dominance - Inhibition of growth of lateral buds by the terminal buds.

Arboriculture - The art, science, and technology of tree care.

Arboricultural manual - Means the Arboricultural Specifications and Standards of Practice for the City of Spokane which contains regulations and standards for the planting, pruning, removal, and maintenance of trees and shrubs on public property and a program for developing and improving the tree, shrub, and other plant resources of the community.

Backfilling - Refill an excavated hole with the soil material that was originally dug out of it.

Balled and Burlapped - Having the root system and soil wrapped in burlap for moving and planting a tree or other plants.

Bare root - Tree or other plant taken from the nursery with exposed root system and without soil.

Best Management Practices (BMP) - ISA has developed a series of Best Management Practices (BMPs) for the purpose of interpreting tree care standards and providing guidelines of practice for arborists, tree workers, and the people who employ their services.

Branch Bark Ridge - The raised area of bark in the branch crotch that marks where the branch and parent meet.

Branch Collar - The swollen area at the base of the branch.

Caliper - Trunk diameter measurements on young trees are taken six (6") inches above the soil. Once a tree's caliper exceeds four (4") inches, the tree is measured at a height of twelve (12") inches.

Canopy - The part of the tree composed of leaves and small twigs.

Crown Cleaning - Selective pruning to remove one (1) or more of the following parts: dead, dying, diseased, and/or broken branches.

Commercial tree work - Means any work performed on street or public trees by a person retained by the property owner or public utility.

Council of Tree and Landscape Appraisers (CTLA) - A special group of individual volunteers coming from a broad spectrum of plant and landscape related enterprises that produce a textbook guide of standards that place value on trees.

Crown - The leaves and branches of a tree measured from the lowest branch on the trunk to the top of the tree.

Cultivar - A plant variety that has been produced in cultivation by selective breeding. Cultivars are usually designated in the style *Taxus baccata* "Variegata."

Diameter at Breast Height (DBH) - DBH refers to the tree diameter measured at 4.5 feet above the ground. Where a tree splits into several trunks below typical DBH, the DBH for the tree is the square root of the sum of the DBH for each individual stem squared (example with three (3) stems: $DBH = \text{square root of } [(stem 1)^2 + (stem 2)^2 + (stem 3)^2]$).

Director - Means the director of the parks and recreation division or the director's designee.

Call Before You Dig - A not-for-profit clearinghouse that notifies participating utility companies of your plans to dig. In turn, these utilities (or their contract locating companies) respond to mark out the location of their underground facilities. This is a free service, funded entirely by its member utility companies. Call 811.

Exotic Species - Plant or animal species introduced into an area where they do not occur naturally, non-native species.

Geographic Information Systems (GIS) - Designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data. GIS is commonly used to inventory urban forest function, form, and location.

Girdling Root - A girdling root is defined as a root that grows around the trunk of the tree thus tending to strangle the tree. Girdling roots act like an ever-tightening tourniquet, restricting and cutting off the flow of water and nutrients.

Hazardous tree - Means any tree or tree part that poses a high risk of damage to persons or property.

Heading Cuts - 1. Cutting a currently growing, or a 1-year-old shoot, back to a bud. 2. Cutting an older branch or stem back to a stub in order to meet a defined structural objective. 3. Cutting an older branch or stem back to a lateral branch not large enough to assume apical dominance in order to meet a defined structural objective. Heading may or may not be an acceptable pruning practice, depending on the application.

Heritage tree - Means a tree or collection of trees that is particularly desirable because it has valued, unique characteristics that set it apart from other similar trees as specified by Spokane Municipal Ordinance 12.02.975.

Included Bark - Bark that occurs in a crotch between branch and trunk or between codominant stems. Included bark usually prevents the trunk from growing around a branch or occurs on defective V-shaped crotches in which the bark grows inward and on itself, causing a physical weakness where the co-dominant leaders meet.

International Society of Arboriculture (ISA) - An international non-profit organization headquartered in Atlanta, Georgia. Its mission statement: "Through research, technology, and education promote the professional practice of arboriculture and foster a greater public awareness of the benefits of trees." The ISA also administers the only international professional credentials program for the arboriculture industry.

Invasive Species - An invasive species is a plant or animal that is not native to a specific location (an introduced or exotic species); and has a tendency to spread, which is believed to cause damage to the environment, human economy and/or human health.

Lion Tailing - Removing the interior branches and foliage of a tree. Lion tailing transfers weight to the ends of branches and may result in sunburned bark tissue, water sprouts, reduced branch taper, increased load on branch unions, weakened branch structure, and breakage. Vigorous production of water sprouts on interior limbs is often a sign of over-thinning or lion tailing.

Multi-stemmed tree - Means a tree that has one (1) stem at ground level but that splits into two (2) or more stems above ground level. Trees whose stems diverge below ground level are considered separate trees.

Native Species - Can be either endemic (found only within a particular region) or indigenous (found both within the region and elsewhere).

Major pruning - Means the pruning or cutting out of branches two inches (2") inches in diameter or greater, root pruning, cutting out of branches and limbs constituting greater than fifteen percent (15%) of the tree's foliage bearing area and pruning trees with branches that are within ten feet (10') feet of overhead power lines. The work shall retain the natural form of the tree.

Minor pruning - Means pruning or cutting out of water sprouts, suckers, twigs, or branches less than two inches (2") inches in diameter, or which constitutes less than fifteen percent (15%) of the tree's foliage bearing area. The work shall retain the natural form of the tree. Removal of dead wood, broken branches, and stubs are included within the definition of minor pruning. Minor pruning of street trees may be performed by the owner of the adjacent property without obtaining a permit from the City.

Public place - Means property owned in fee by the City of Spokane.

Public tree - A tree on city-owned property. A public tree may also be a street tree.

Public utility - Means any organization that has a franchise to utilize the public rights-of-way.

Right(s)-of-way- Means that strip of land:

1. dedicated for public travel, including the main traveled portions of the streets and sidewalks as well as parking or planting strips, pedestrian buffer strips, and other associated areas, or over which is built, public streets, sidewalks, or alleys for public travel; or
2. used for or dedicated to utilities installation within the right-of-way.

Severe crown reduction - Means the specific reduction in the overall size of a tree and/or the severe internodal cutting back of branches or limbs to stubs within the tree's crown to such a degree as to remove the normal tree canopy and disfigure the tree. Severe crown reduction is not a form of pruning and, for street trees and trees within the public rights-of-way, is prohibited.

Significant Tree - Means a tree six (4") inches or greater in diameter (DBH). Dead trees shall not be considered significant trees.

Street tree - Means any tree or shrub located within the public rights-of-way.

Topping Cuts - The reduction of a tree's size using heading cuts that shorten limbs or branches back to a predetermined crown limit. Topping is not an acceptable pruning practice.

Tree committee - Means the urban forestry tree committee created by Spokane Municipal Ordinance 04.28.010.

Tree lawn, parking strip, and planting strip - Terms are used interchangeably to mean the area between the curb and sidewalk.

Tree Protection Zone (TPZ) - The means by which to protect trees on development sites and should protect both roots and crown spread simultaneously. The TPZ should be isolated from any construction disturbance unless previously agreed with the project Arborist.

Trunk Flare - The outwardly curving base of a tree where it joins the roots, often distinguishable as individual root buttresses.

Urban Forest - Tree populations in urban settings for the purpose of improving the urban environment. The urban forestry plan advocates the role of trees as a critical part of the urban infrastructure.

Urban forestry plan - Means a comprehensive plan addressing the long-term goals and strategic planning related to tree planting, pruning, removal, and maintenance needs of trees located in public places to encourage the sustainability of the urban forest. Neighborhood specific tree plans or neighborhood land use plans which incorporate sections or language related to public trees shall be incorporated in the general urban forestry plan and neighborhoods shall consider the urban forestry plan in the development of neighborhood specific tree plans or land use plans.

Section 8. Appendices

A. Pruning Techniques

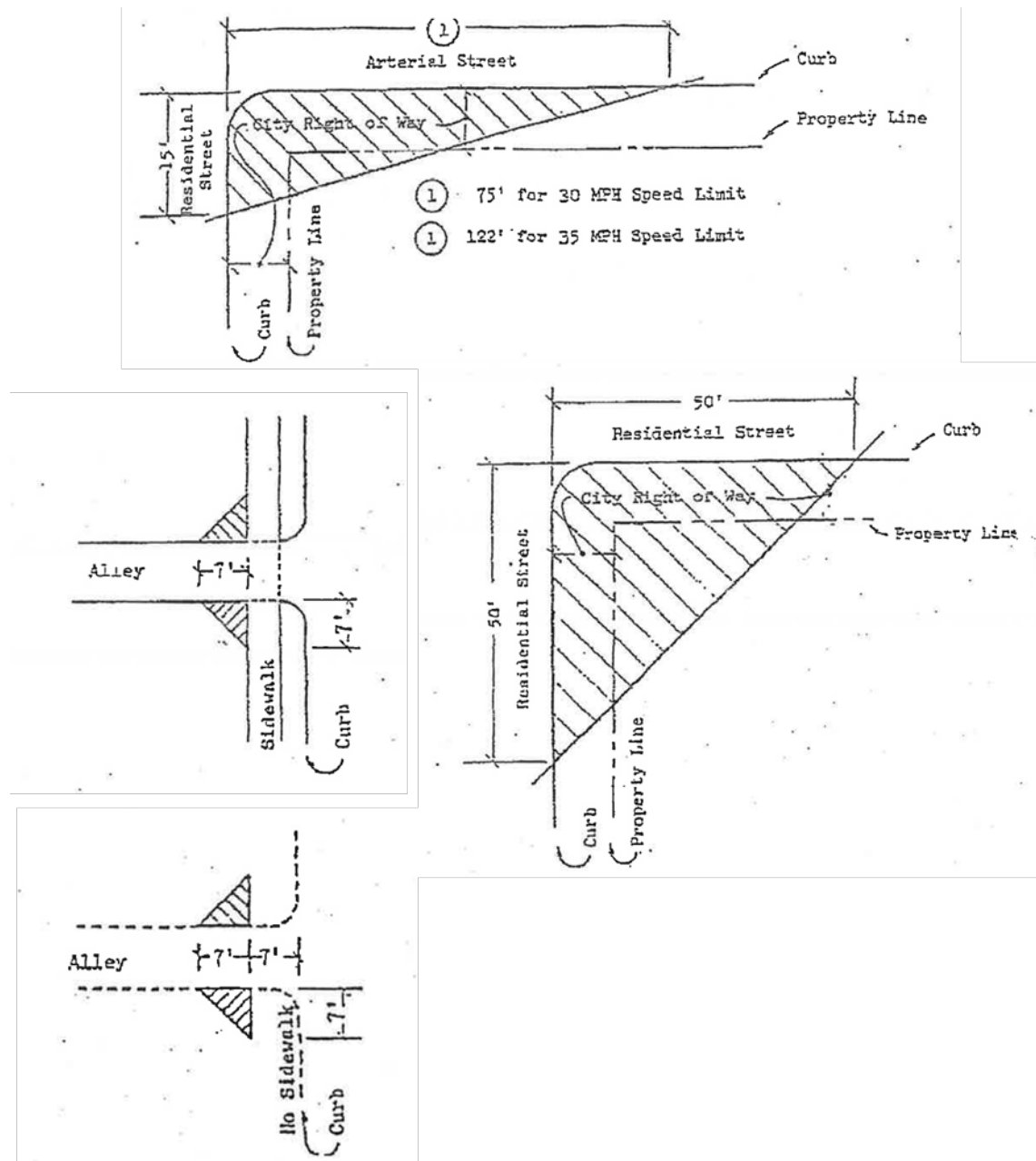
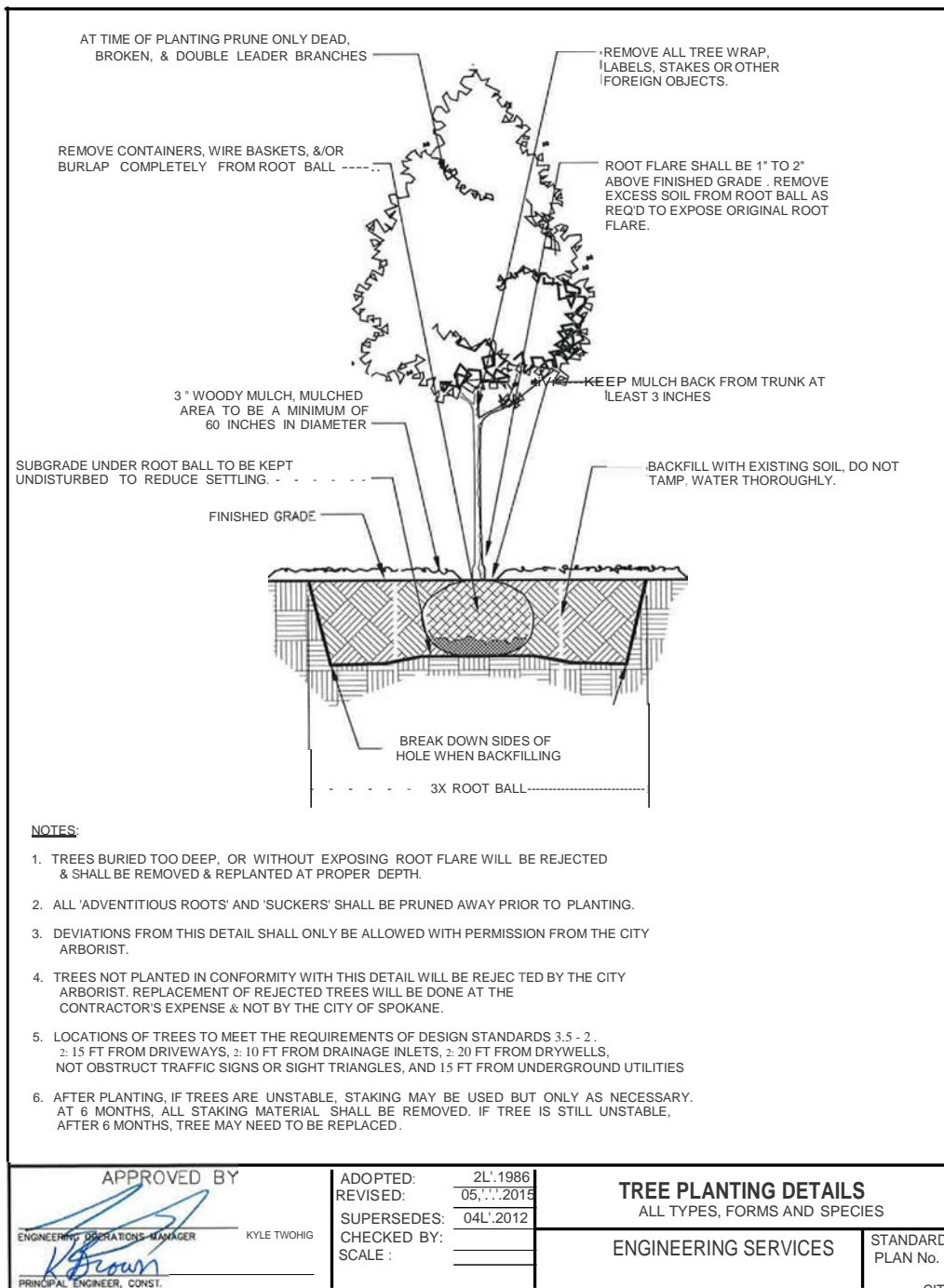
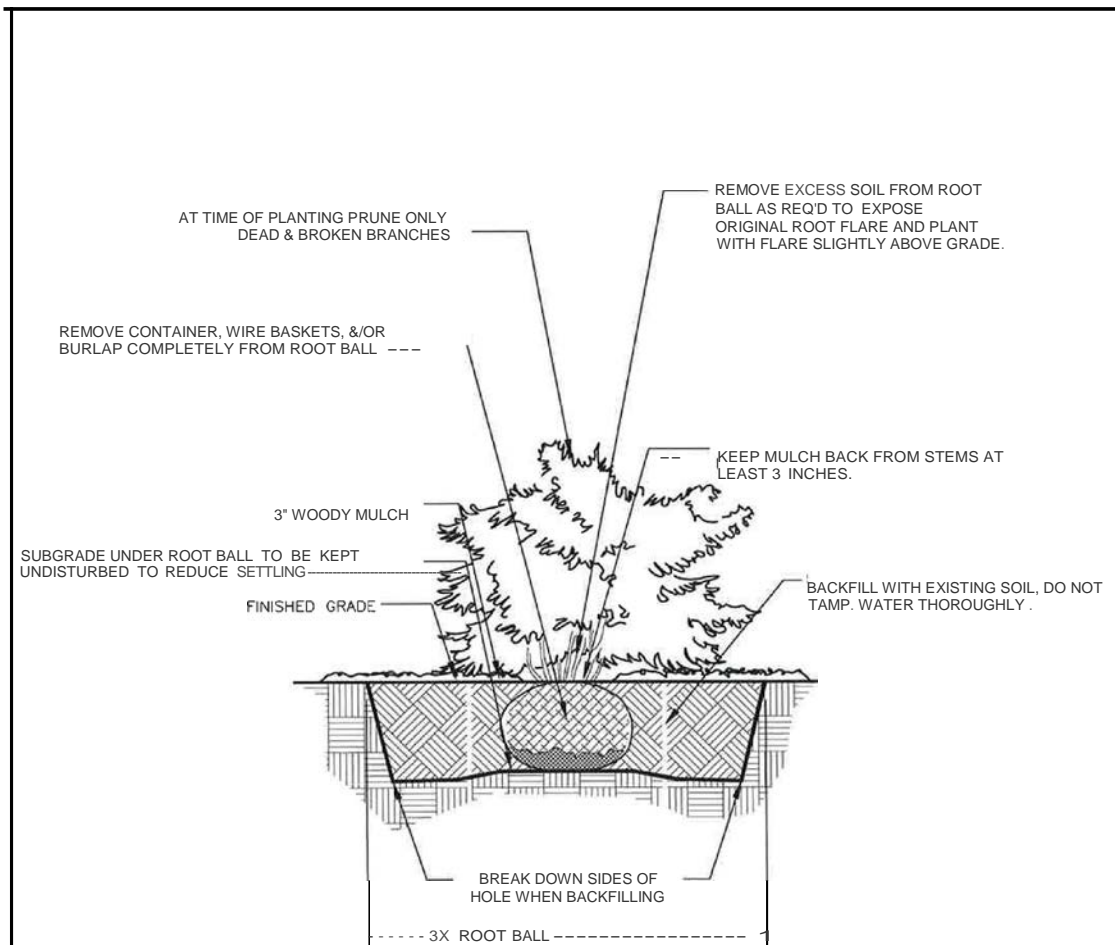


Figure 1. Clear view intersection requirements

B.Planting Techniques



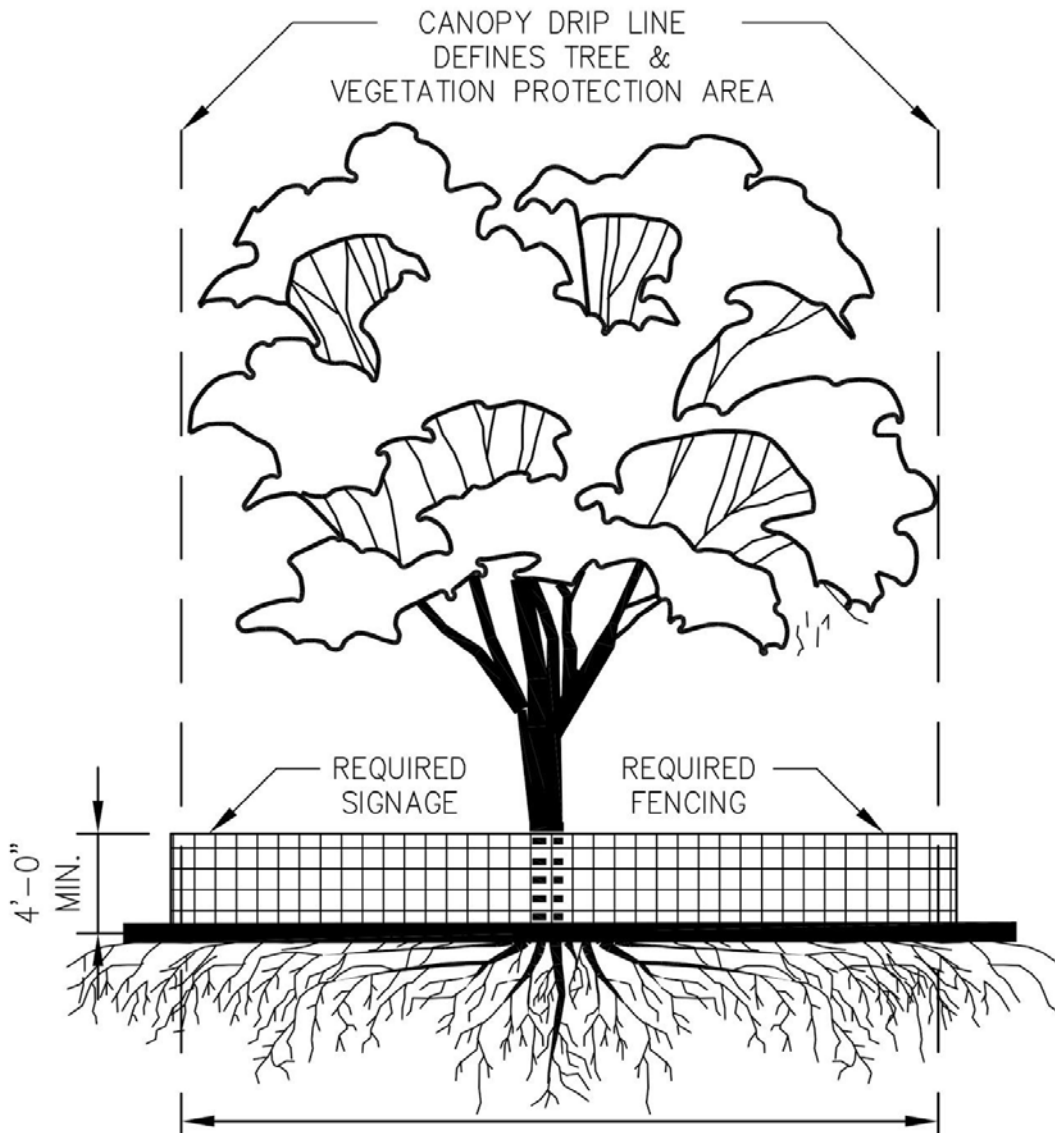


NOTES:

1. SHRUBS BURIED TOO DEEP, OR WITHOUT EXPOSING ROOT FLARE WILL BE REJECTED & SHALL BE REMOVED & REPLANTED AT PROPER DEPTH.
2. DEVIATIONS FROM THIS DETAIL SHALL ONLY BE ALLOWED WITH PERMISSION FROM THE CITY ARBORIST.
3. SHRUBS NOT PLANTED IN CONFORMITY WITH THIS DETAIL WILL BE REJECTED BY THE CITY ARBORIST. REPLACEMENT OF REJECTED SHRUBS WILL BE DONE AT THE CONTRACTOR'S EXPENSE & NOT BY THE CITY OF SPOKANE.

<p style="text-align: center;">APPROVED BY</p> <p style="text-align: center;">KYLE IWOHIG</p> <p style="font-size: small;">ENGINEERING OPERATIONS MANAGER</p> <p style="font-size: x-small;">PRINCIPAL ENGINEER, CONST. HENNER H. BROWN, P.E.</p>	<p>ADOPT ED: 2L1986</p> <p>REVISED: osL201s</p> <p>SUPERSEDES: 04L2012</p> <p>CHECKED BY: _____</p> <p>SCALE: _____</p> <p>REVISED BY: MLD</p>	<p>SHRUB PLANTING DETAILS</p> <p>ALL TYPES, FORMS AND SPECIES</p> <hr/> <p>ENGINEERING SERVICES</p> <p>CITY OF SPOKANE, WASHINGTON</p>	<p>STANDARD PLAN No.</p> <p>V-102</p>
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C. Tree Protection Zone



<http://www.seattle.gov/Documents/Departments/SDCI/Codes/TreeProtectionAreaSign.pdf>

Section 9. Additional Resources

The following published documents provide additional resources on tree care.

American National Standards Institute Z133.1; A300 (part 2 and 3).

Trees and Development: A technical guide to preservation of trees during land development. Nelda Matheny and James Clark. International Society of Arboriculture. 1998.

Tree Protection on Construction and Development Site: A Best Management Practices Guidebook for the Pacific Northwest. Oregon State University Extension Service. December 2009.

<https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/em8994.pdf>