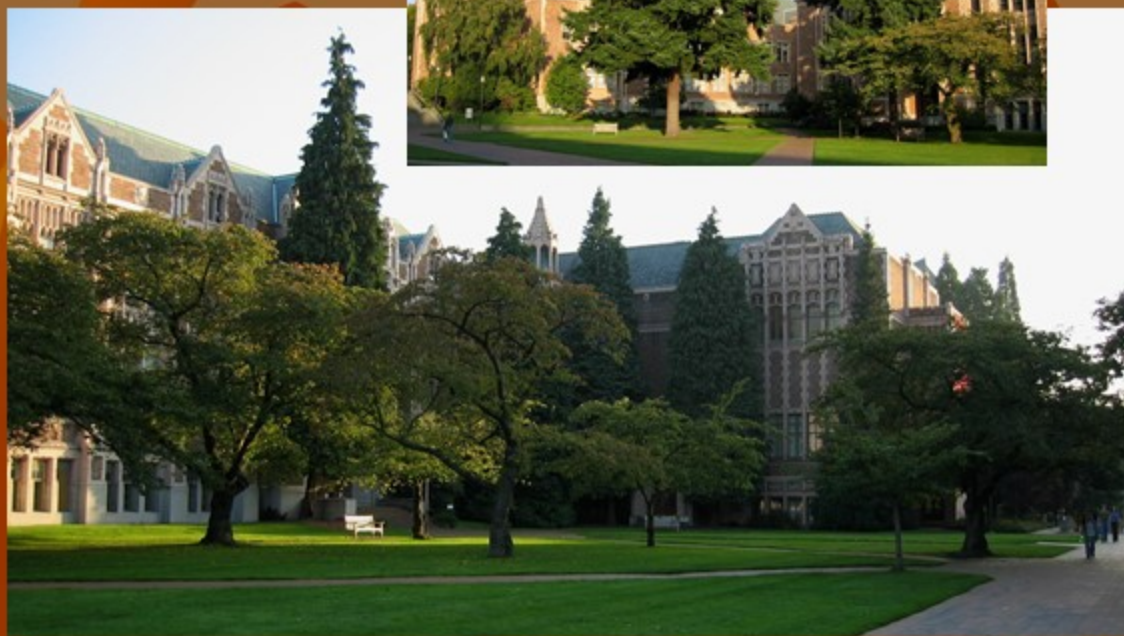


University of Washington

Tree and Woody Shrub

SELECTION AND PLANTING SPECIFICATIONS



University of Washington Tree and Woody Shrub Selection and Planting Specifications

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A project submitted in partial fulfillment of the
requirements for the degree of

Master of Environmental Horticulture
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Table of Contents

PURPOSE.....	3
Part 1.0 GENERAL.....	4
Description of Work.....	4
Quality Assurance.....	4
Job Conditions.....	5
Inspections and Payment.....	5
Work Schedule and Project Completion.....	5
Guarantee.....	5
Questions.....	5
Part 2.0 MATERIALS.....	6
Applicable Specifications and Standards.....	6
Plant Selection.....	6
Accessory Materials.....	9
Soil.....	9
Part 3.0 EXECUTION.....	10
Planting Season.....	10
Shipping, Handling, and Storage of Plant Materials.....	10
Plant Delivery and Inspection.....	10
Planting and Installation Procedures.....	11
Clean-Up.....	14
Acceptance of Initial Planting Operation.....	14
Maintenance Period.....	14
Guarantee Period and Replacement.....	14
Final Inspection and Acceptance.....	14
Part 4.0 DEFINITIONS.....	15
Part 5.0 ACKNOWLEDGEMENTS.....	16
Part 6.0 REFERENCES FOR SPECIFICATIONS.....	17

PURPOSE

On September 4, 1895, the University of Washington campus opened. From its conception, the campus was declared an ornamental garden and arboretum. Over the years, this landscape has evolved in a way that still holds this notion to be true.

From the University's very beginning the trees and shrubs on campus have been the focus of historical significance, educational opportunities, and aesthetic beauty. Many trees on campus have been either donated, or planted, by dignitaries and people of significance from around the world. Other trees and shrubs have been planted to commemorate historical dates and times. Today, the trees still serve as a collection used for educational and research purposes by such diverse disciplines as botany, forestry, horticulture, and medicine. Over the years students, staff, faculty, and visitors always considered the trees and shrubs on campus as a place of great beauty and aesthetic appeal.

The University of Washington campus is comprised of both young and mature trees from approximately 480 different species. Trees provide many services to people using the campus including providing shade during the summer months, and changing scenery throughout the seasons, especially in Spring and Autumn when leaves come and go. Research has also shown the presence of trees and shrubs help create peaceful settings providing stress relief.

Because of their critical roles, trees and shrubs should be selected with an attitude that they will be on campus for a long time. Only the best possible specimens should be allowed in order to ensure longevity and reduced maintenance and replacement costs. Having trees and people share common space inevitably means risks and hazards. Many times when limbs drop or trees fall over it is because of poor structural characteristics originating at the time of plant selection, poor planting techniques, or poor maintenance practices. This document attempts to reduce some of these future hazards by providing selection and planting specifications supported by the most current research in the field of arboriculture.

It is our intention and hope that this document is not only seen as a regulatory contract, but as an attempt by the University to provide the students, staff, faculty, and visitors with the safest, healthiest, and longest lasting trees and shrubs for generations to enjoy.

The University of Washington thanks you for your cooperation in complying with these contractual specifications.

PART 1.0 GENERAL

1.1 Description of Work

- A. Scope of Work:** Furnish and install all plants and materials necessary for planting, as described in these specifications and as indicated on the planting plan. This work shall include materials, labor, equipment, shipping costs, and any other work necessary for the complete installation and establishment of the landscape planting.
- B. Examination of Plans, Specifications, and Sites:** Bidders may examine all plans, specifications and sites. No deviation from specifications will be allowed without written consent from the University of Washington Representative prior to award of contract. Failure to fully examine project sites and work requirements will not relieve bidder from performing work as per plan and specifications.

1.2 Quality Assurance

- A. Pre-Qualification of Bidders:** All bidders, prior to award of the contract, must present satisfactory evidence that they have been regularly engaged in this type of work. Bidders must have the necessary labor, materials, and equipment to execute work to the satisfaction of the University of Washington Representative. Satisfactory evidence may include a list of references of projects completed within the last two years with a brief description of the project including contact information. Evidence could also include a list of equipment and employees including any special training/certifications that employees possess.
- B. Award of Contract or Contracts:** The contract will be awarded to the lowest bidder whose proposal complies with all requirements. The University of Washington Representative reserves the right to reject any and all proposals and to accept the bid that is most advantageous to the University of Washington.
- C. Insurance and Worker's Compensation:** The Contractor/Bidder shall furnish evidence of Worker's Compensation, public liability and property damage insurance. Limits of insurance shall be as follows: Minimum amounts of \$1 million bodily injury and \$500,000 property damage including both injury and property damage caused by vehicles and machinery. A certificate of insurance shall be filed with the University of Washington Representative.
- D. Proposals:** All proposals, including bids or change proposals shall be made on the forms provided by the University of Washington Representative. Bidders must submit prices for the bid in both words and figures. In case of discrepancy, the written word shall prevail. Materials of any sort shall not be shipped C.O.D., and any shipment so made will be refused by the University of Washington.

1.3 Job Conditions

- A.** The University of Washington Representative will provide "notice to proceed" to the awarded bidder within 30 days from award.
- B.** Awarded bidder must familiarize themselves with the existing project conditions e.g., utilities, soil strata, drainage, sightlines, and other contractors on site, prior to beginning work. Conflicts should be addressed with the University of Washington Representative.
- C.** Proceed with and complete landscape work as rapidly as portions of the site become available, working within seasonal limitations for each kind of landscape work required.
- D.** Awarded bidder is responsible for protecting utilities, paving, and other facilities from damage during landscape installation. Bidder must notify University of Washington Representative 48 hours prior to beginning work.
- E.** All work performed shall be in strict compliance with local codes and ordinances. All work performed shall be executed while maintaining strict compliance with city, county, and state laws or regulations. Any permits or documents required or requested shall be submitted to the appropriate regulatory agency.

- F. Any errors, omissions, unforeseen underground utilities or problems encountered in the work shall be brought to the attention of the University of Washington Representative prior to proceeding with the work; failure to do so shall obligate the Awarded Bidder to assume responsibility for the consequent extra work, cost, and liability.

1.4 Inspections and Payment

Inspections shall occur when indicated in this contract. Inspections must be completed in accordance with the requirements in this contract, failure to comply with inspections may delay payments. Payments for this project will be distributed as follows:

- 1st Payment = 50% of the contract sum upon plant delivery and acceptance inspection.
- 2nd Payment = 40% of the contract sum after acceptance of initial planting operation inspection; specifically meaning, after all phases of tree and shrub planting have been completed, including the removal of all materials and machinery from the site excluding what is needed for the maintenance and guarantee period.
- 3rd and Final Payment = 10% of the contract sum after final acceptance/inspection at the end of the maintenance/guarantee period.

1.5 Work Schedule and Project Completion

Work on this project may occur between 6:00am-6:00pm Monday through Friday; No work will be allowed on weekends without prior written approval of the University of Washington Representative. In addition, depending upon location of work, there may be additional time restrictions imposed by the University of Washington Representative. All work shall be completed by _____ unless otherwise approved as noted in bid/project specifications.

1.6 Guarantee

All work and materials shall be guaranteed in writing as specified in section 3.7.

1.7 Questions

All questions regarding these specifications shall be directed to the University of Washington Owner's Representative.

University of Washington Representative: _____

Address: _____

Phone: _____ Email: _____

PART 2.0 MATERIALS

2.1 Applicable Specifications and Standards

- A. Trees and woody shrubs selected should conform to the most current American Standard for Nursery Stock (ANSI Z60.1; table below lists some required dimensions). Trees and woody shrubs selected shall also meet the specifications included in this document.

Trunk caliper (inches) ¹	Minimum ball diameter on field grown shade trees (inches)	Minimum root ball diameter on fabric container grown trees	Minimum container size (gallons)	Minimum tree height on standard trees (ft.)	Minimum tree height on slower grown trees (feet)	Maximum tree height (feet)
1	16	12	5	6	5	10
2	24	18	20	10	8	14
3	32	20	45	12	9.5	16
4	42	30	95	14	10.5	18
5	54	36	95			

- B. **Ball and Burlap, Containers, Bare root** – Tree and shrub availability will vary based on time of year. When available, bare root and ball and burlap trees and shrubs are preferred over container stock. If purchasing container stock, careful inspection of root systems should be done to ensure that they conform to the specifications in this document.
- C. **Selection of Genus and Species** - All trees and shrubs selected must comply with the Plant Association Master Plan for the specific project location on campus.

2.2 Plant Selection

- A. **Crown Form** – Both excurrent and decurrent trees shall have a single, relatively straight central leader and tapered trunk, free of codominant stems and vigorous, upright branches that compete with the central leader.



- B. **Foliage** - Leaves should appear healthy and of correct size, shape, and color for the particular species at that stage of growth or time of year. Leaves should be free of symptoms and signs of biotic or abiotic damage.
- C. **Branches** - Tree branches should be distributed radially around and vertically along the trunk, forming a generally symmetrical crown typical for the species.

1. Main branches shall be well spaced and free of included bark. Minimum vertical spacing between scaffold branches on large (i.e. oak, ash, callery pear, big-leaf maple, beech) growing trees should be 6 inches apart. Minimum vertical spacing between scaffold branches on small (Japanese maples, Japanese snowbell, crape myrtle, and many flowering fruit trees) growing trees should be 3 inches apart.



Unacceptable



Preferable

2. The diameter of scaffold branches shall be less than 2/3 (two thirds) the diameter of the main trunk, measured one inch above the branch.



Unacceptable



Acceptable

3. Temporary branches are desirable along the lower trunk, particularly for trees less than 1.5 inches in trunk diameter. Temporary branches should be no greater than 3/8 inch in diameter. Heading of temporary branches is often necessary to limit growth; this should have already been done at the production nursery.



Acceptable



Preferable

D. Trunk - The trunk shall be free of wounds (except for properly made pruning cuts), sunburned areas, conks, fruiting bodies, cankers, galls, cracks, bleeding areas, and signs of boring insects. The trunk shall be securely attached to the root ball. The trunk diameter shall be sufficient so that the tree will remain vertical without the support of staking.



Unacceptable



Acceptable

E. Tree Height and Diameter - Tree and woody shrub dimensions shall be stated at the time bids are solicited. If dimensions state only one criteria for size selection (i.e. caliper), the bidder is responsible for ensuring that plants selected conform to any other minimum sizes specified in the American Standard for Nursery Stock (ANSI Z60.1); this includes minimum height and root ball dimensions.

F. Roots -

2. Regardless of nursery production method, roots shall be free of girdling, kinked, or circling roots. Roots shall be free of visible damage.



Unacceptable



Acceptable

2. Root collars should be inspected for radial distribution of main roots around the trunk. The inspection should be done by carefully removing the top two inches of soil from around the base of the trunk. This inspection should be done on a minimum of two trees or shrubs from each species. Trees or shrubs with 2 or fewer main roots, or roots occurring radially only on one side will not be accepted by the University of Washington Representative.



Unacceptable



Acceptable

3. The rootball periphery should be free of large circling and bottom-matted roots.



Unacceptable



Preferable

G. Moisture Status - At the time of inspection and delivery, the root ball shall be moist throughout. The crown shall show no signs of moisture stress as indicated by wilted, shriveled, dead leaves or branch dieback. The roots shall show no signs of excess soil moisture conditions as indicated by poor root growth, root discoloration, distortion, death or foul odor.

H. Inspection for Conformity – Plants shall be subject to inspection for conformity to specification requirements and approval by the University of Washington Representative at their place of growth prior to award of bid. Inspection outside the state of Washington shall be made through photographs submitted by the bidder/contractor. If tagging of trees and shrubs will be made, the University of Washington reserves the right to have a representative present during tagging, or before digging begins. **Note:** The University of Washington Representative reserves the right to reject any or all trees and shrubs that do not meet the specifications required in this contract or that have been damaged. The University of Washington Representative shall be the sole judge of acceptability of stock at any time during the course of this contract.

2.3 Accessory Materials

A. Fertilizer - Fertilizer requirements are covered in section 3.4 – H.

B. Mulch - Mulch requirements are covered in section 3.4 – F.

C. Root Barriers – Root barrier requirements are covered in section 3.4-E.

D. Pesticides - No pesticides or herbicides shall be used on University of Washington property without written permission of the University of Washington Representative.

2.4 Soil

A. Soil Analysis – Before planting, a soil analysis shall be conducted to determine soil nutrient levels, pH, and texture. This analysis shall be done according to the directions of a qualified soil and plant testing laboratory. A copy of the results and recommendations from the soil testing laboratory shall be delivered to the University of Washington Representative before planting of trees and shrubs begin.

B. Origin – Soil on site should be utilized or set aside for planting if it is not found or thought to contain harmful chemicals or substances, possibly as a result of construction activity. If additional soil is required for planting trees and shrubs (for example, to reach proper grade), it should have a loam texture (which represents a desirable proportion of sand, silt, and clay for healthy tree and shrub growth). Additional soil must be thoroughly amended with soil on site in order to minimize soil interface problems. The preferred method for amending soil is to rototill soil within the required planting area sized for each tree or shrub. Soil should be amended to a depth of at least 8 inches into original soil on site.

C. Amendments – Soil amendments shall not be used without the approval of the University of Washington Representative; this does not pertain to fertilizer, but does include amendments to alter pH or soil structure such as lime, sulphur, peat moss, fir bark, manures, or any other organic amendments.

D. Soil pH – Soil pH shall be adjusted according to the recommendations of the soil testing laboratory, but not before notifying the University of Washington Owner's Representative.

E. Weeds – Soils or mulches used for planting shall be free of weeds and should originate from a source that is not known to harbor large quantities of non-germinated weed seed.

PART 3.0 EXECUTION

3.1 Planting Season

Planting should be done within the following dates, but may be altered at the discretion of the University of Washington Representative. These timelines are based upon environmental conditions that historically occur during these time periods which will facilitate faster tree and shrub establishment.

February 1 - April 30 **OR** September 15 - November 15

3.2 Shipping, Handling, and Storage of Plant Materials

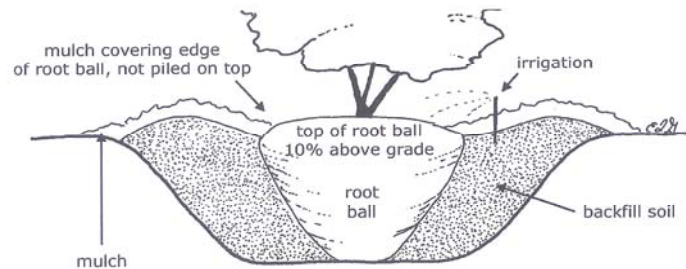
- A.** Bidder/Contractor shall take care to prevent the injury and drying out of plants during transportation. Should the roots dry out, large branches be broken, earth balls break or be loosened, or bark be torn, the University of Washington Representative reserves the right to reject the injured tree(s) or shrub(s) and have them replaced at no additional cost to the University of Washington.
- B.** The preferred method of transportation should be enclosed truck, and when necessary, refrigerated. Roots of each load of bare root stock shall be adequately covered with wet soil, sawdust, wood chips, or other acceptable moisture-holding medium until planted. Loads shall be covered with an open-mesh tarpaulin, canvas, or other material to ensure that trees do not become overheated or damaged by wind during transport. Loads not protected in this manner may be rejected.
- C.** Plants must be protected at all times from sun or drying winds. Those that cannot be planted immediately upon delivery shall be kept in the shade and watered well to prevent drying of the root ball. Trees and shrubs shall not remain unplanted longer than three days after delivery without permission from the University of Washington Representative.
- D.** Plants shall be lifted and handled with suitable support of the soil ball and shall not be lifted by the trunk or branches.

3.3 Plant Delivery and Inspection

- A. Notification** – The bidder/contractor shall give the University of Washington Representative notice of delivery time three to five days prior to delivery.
- B. Proper Identification** - All trees and shrubs shall be true to type or name as ordered or shown on the plans and shall be individually tagged or tagged in groups by species and cultivar. Tags or labels shall not girdle or damage trees and shrubs.
- C. Certification** - All trees and shrubs shall comply with Federal and State laws requiring inspection for plant disease and pest infestations. Inspection certificates required by law shall accompany each shipment of plants. Clearance from the County Agricultural Commissioner as required by law shall be obtained before planting trees delivered from outside King County.
- D. Inspection** – Trees and shrubs shall be inspected by the University of Washington Representative upon delivery. A contractor’s representative shall be present at all inspections. Installation shall not begin until after all trees and shrubs are inspected and accepted by the University of Washington.
- E. Compliance** – The University of Washington Representative reserves the right to reject any or all trees and shrubs that do not meet the specifications required in this contract or that have been damaged. The University of Washington shall be the sole judge of acceptability of stock at any time during the course of this contract.

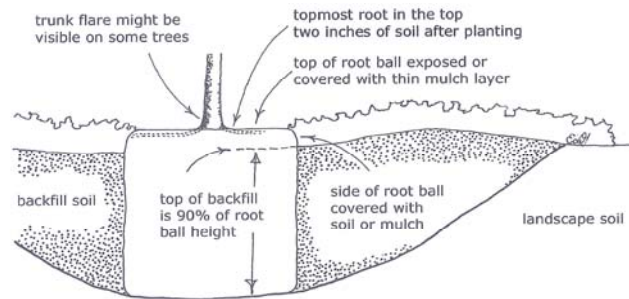
3.4 Planting and Installation Procedures

- A. Layout/Coordination/Inspection** - Bidder/Contractor shall give the University of Washington Representative 3-5 days notice prior to planting trees and shrubs. If this project involves blueprints or drawings of landscape design and layout, then the contractor will be responsible for staking/flagging planting positions prior to planting for inspection and approval by the University of Washington Representative. If blueprints or drawings do not exist, or they do not include measurements of planting positions, then a University of Washington Representative shall stake/flag planting positions 3-5 days prior to beginning planting.
- B. Excavation of Planting Area** – Bidder/Contractor shall obtain permission from the University of Washington Representative to use heavy machinery on site (i.e., skidsteers, backhoes, dump-trucks). Machinery used on site shall be operated with extreme caution and at all times with the safety of bystanders in mind. Care shall be taken to not operate equipment over or under areas and structures that could incur damage (i.e., water mains, irrigation lines, pipes, manholes, powerlines). When operating heavy equipment there shall always be at least one person observing and communicating directly with the operator to ensure safety on the site. Before excavating planting holes with heavy machinery, a survey shall be done and all underground utilities shall be marked in a semi-permanent way (i.e., survey flags, ground marker paint) to ensure that markings are clearly visible during excavation. Bidder/Contractor shall notify the University of Washington Representative for inspection 3-5 days prior to beginning excavation on site. Bidder/Contractor is responsible for maintaining ground utility markers during the entire time period of site excavations. The University of Washington Representative reserves the right to immediately halt all planting operations if conditions are observed that may cause injury to people or University of Washington property.
- C. Planting Hole** - The planting hole for trees and shrubs shall be dug to a depth that is only 90% of the root ball depth. The sides of the planting hole shall be tapered at approximately a 45 degree angle. The sides of the hole should not be smooth or glazed, but should be jagged and rough in order to discourage circling roots. The overall width of the planting hole should be three times the width of the root ball, measured at the bottom of the planting hole. If off-site soil is being added, then soil should be amended according to requirements stated in 2.4-B.



- D. Planting** - At all times trees and shrubs shall be handled and moved by their root balls, not by their trunks. Plants shall be planted according to diagram below. All circling roots visible on the outside of the root ball shall be cut through using hand pruners. The outside edges and bottom of the root ball should be loosened by hand in order to facilitate quicker establishment of roots into the soil outside of the root ball. The mulch layer over the root ball shall not be thicker than ½ inch deep, and no mulch shall be applied to the inner half of the root ball surface. Mulch extending outside of the root ball shall increase from 2-3 inches in depth until entire planting hole is covered with mulch. Backfill soil shall be soil that was removed when digging the planting hole, except in cases where soil finish grade on site requires additional soil to be added from off-site. If off-site soil is added to planting areas, then requirements included in sections 2.4-B and 2.4-C shall be followed. When planting trees and shrubs, all burlap, wire baskets, or other material shall be removed without damage to the tree or root ball. To make removal easier, it is recommended that trees with wire baskets or burlap have the lower ¼ of the basket or burlap removed before setting plants in the planting hole. Once the tree or shrub is set in the planting hole, backfill soil should be added to the hole in soil lifts as the root wrapping material is carefully removed. Regardless of method, when removing wire baskets or burlap, bidder/contractor must do it in a way that does not allowed the root ball to break apart, causing damage or breakage of roots. When adding backfill soil, water should be used to settle the soil into place and eliminate air pockets or voids. Backfill soil should be settled firmly in place, but not compacted greater than the surrounding undisturbed soil. Trees and shrubs shall be vertical and

plumb when planting is complete. Trunk flare shall be visible, or topmost root shall be in the top two inches of soil after planting. Plant I.D. tags shall be left on at this time, but should be checked and loosened to ensure that they are not, and will not cause girdling.



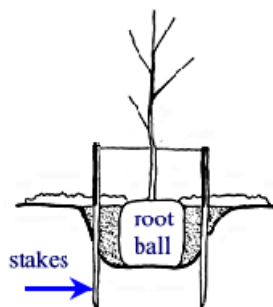
E. Root Barriers - Root barriers shall only be installed when designated in the plans or bid specifications. Barriers shall be installed in strict compliance with the manufacturer’s specifications.

F. Mulch – Mulch applied over the soil surface is an excellent technique for improving soil structure, retaining moisture, and mitigating soil temperatures in the root zone. Mulch shall either be arborist wood chips acquired from a source that is not known to contain diseased wood or weeds, or mulch may be aged fine fir bark that is approximately ¼-1/2 inch diameter thickness. Large fir bark mulch shall not be used.

G. Amendments – Soil amendments are covered in section 2.4-C.

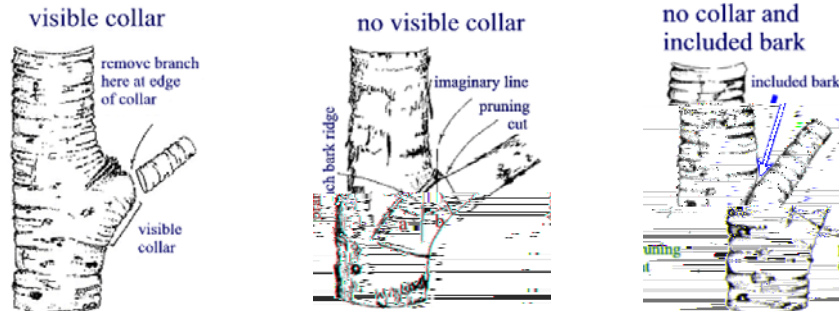
H. Fertilization - Fertilization of trees and shrubs should be done based on recommendations from the soil analysis done on site. Fertilizers used for the ongoing maintenance and health of trees and shrubs should be a slow release type of fertilizer (i.e. Osmocote, or Apex brands). All fertilizers or nutrient amendments shall either be incorporated into the soil surrounding the plant, or surface applied with a layer of mulch placed over the fertilizer in order prevent human or animal contact with the fertilizer. **Note:** If the University of Washington Representative waives the requirement of obtaining a soil analysis, then a slow release fertilizer with a ratio of 3:1:2 should be automatically applied at the manufacturers recommended rates.

I. Guying and Staking - Staking of trees and shrubs is not recommended as a routine practice. Trees and shrubs may need to be staked or guyed in order to prevent movement of the root ball during root establishment. Only trees and shrubs designated by the University of Washington Representative shall be staked or guyed. Ties must be made of a material that does not cause damage to the trunk (wire or wire covered by a hose will not be allowed). Ties shall be attached loosely enough to allow the trunk to sway in the wind without allowing movement of the roots. Ties shall be secured at the lowest point on the trunk at which the root ball remains stationary, approximately one-third up the tree starting at ground level. A minimum of three stakes made of a strong and durable material (thick wooden stakes are preferred) should be placed evenly around the tree or shrub. Stakes should be driven at least 24 inches into the soil outside of the root ball. Stakes should be placed so that they do not rub branches. Stakes and ties should be routinely checked and adjusted to prevent girdling or damage to trees and shrubs.



J. Trunk Protection – Trunk wraps and protective sleeves shall not be used or left in place unless specifically designated by the University of Washington Representative.

K. Pruning - The only pruning of trees and shrubs allowed shall be for the removal of damaged or broken branches; and then only after approval is given to do so by the University of Washington Representative. Pruning shall conform to American National Standard for Tree Care Operations (ANSI A300). Illustrations of how pruning cuts should be made given particular scenarios are illustrated below. No pruning paint or other wound dressings shall be used during pruning. Pruning tools shall be sanitized before and between cuts made to individual trees. Sanitation of tools may be done by dipping tools in a 5% bleach solution or by spraying cutting surfaces thoroughly with Lysol.



Pruning Cut Scenarios

L. Irrigation – Bidder/Contractor shall be responsible for the irrigation of the trees and shrubs during the length of this contract. Bidder/Contractor should make arrangements with the University of Washington Representative to inspect previously installed or newly installed irrigation systems for adequate irrigation of newly planted trees and shrubs. Adequate irrigation shall be irrigation that covers the entire planting area of any particular tree or shrub and supplies enough water so that trees and shrubs flourish and remain in excellent condition. Whether or not a below ground irrigation system exists at the time of planting, the bidder/contractor shall be responsible for adequate irrigation of the trees and shrubs during the length of this contract. The bidder/ contractor should inquire with the University of Washington Representative about the current plans for irrigation on site; the University of Washington Representative will ensure that the contractor has access to a source of water on site if hand watering will be required.

M. Irrigation Schedule - Research on the irrigation needs of specific plant species in urban environments is currently limited, but growing quickly with time. Below is a recommended schedule for irrigation of trees and shrubs during the planting, maintenance, and guarantee period.

Size of nursery stock	Irrigation schedule for vigor ^{1,2}
< 2 inch caliper	Daily for 2 weeks; every other day for 2 months; weekly until established.
2-4 inch caliper	Daily for 1 month; every other day for 3 months; weekly until established.
> 4 inch caliper	Daily for 6 weeks; every other day for 5 months; weekly until established.

Notes on Irrigation:

- Delete daily irrigation when planting in winter, or during time periods of continuous rainfall. Irrigation frequency can be reduced slightly (e.g. 2-3 times each week instead of every other day) when planting hardened-off, field-grown trees that were root-pruned during production. Establishment takes 12 months per inch trunk caliper.

2. At each irrigation, apply 2-3 gallons per inch trunk caliper to the root ball. Apply it in a manner so all water soaks into the root ball. Do not water if root ball is wet/saturated on the irrigation day.

3.5 Clean-Up

Soil, branches, rejected plants, wrapping materials, and other debris resulting from installation shall be promptly cleaned up and removed. The work area shall be kept safe and neat at all times. Under no condition shall accumulation of soil, branches, or other debris become a public hazard.

3.6 Acceptance of Initial Planting Operation

An inspection shall be conducted by the University of Washington Representative at the completion of initial planting operations; after all trees and shrubs are planted and final site clean-up has been completed. Bidder/Contractor shall give the University of Washington Representative 3-5 days notice to conduct acceptance of initial planting operation inspection. After the site visit for inspection, if necessary, the University of Washington Representative shall give written notice within 2-3 days of any additional changes or alterations that must occur for acceptance. If additional changes or alterations must be performed, bidder/contractor will need a re-inspection by the University of Washington Representative after performing changes. Re-inspection procedures for acceptance of initial planting operation shall be conducted as previously stated until all changes are complete and written notice of approval is given to the bidder/contractor of acceptance of initial planting operation.

3.7 Maintenance Period

This period begins immediately after planting and continues through the guarantee period ending only when the University of Washington Representative conducts a final inspection and gives written approval of final acceptance. During the maintenance period the bidder/contractor shall maintain trees and shrubs by pruning, cultivating, and weeding, as required and needed for healthy growth. Maintenance shall include ensuring that plants are irrigated on schedule and that planting stakes are adjusted or repaired if necessary. Maintenance shall include resetting trees and shrubs to proper grades or vertical positions, as required. Maintenance shall include monitoring trees and shrubs for insect or disease damage and consulting with the University of Washington Representative on methods for treatment.

3.8 Guarantee Period and Replacement

The Bidder/Contractor shall guarantee all trees and shrubs to be healthy and in flourishing condition for a period of 1 year after the Acceptance of Initial Planting Operation inspection. During the one year period, the bidder/contractor shall remove and replace, without cost, and as soon as weather conditions permit, and within a specified planting period, all plants not in a healthy and flourishing condition as determined by the University of Washington Representative any time during the guarantee period. Replacements shall be subject to all the requirements stated in this specification document. The guarantee of replacement trees and shrubs shall extend for an additional period of 60 days from the date of their acceptance after replacement, or if longer, until the end of the one year guarantee period.

3.9 Final Inspection and Acceptance

Bidder/Contractor shall notify the University of Washington Representative 5-8 days prior to the conclusion of this contract for final inspection and acceptance. The University of Washington Representative shall conduct an inspection of the entire site and give written notice within 2-3 days of any changes or alterations that must be made for final acceptance. Any conditions found during final inspection that do not conform to the requirements of this contract shall be the Bidder/Contractor's responsibility to remedy before written approval of final acceptance is given; this contract shall automatically be extended until re-inspection and written approval of final acceptance is given. After being given written approval of final acceptance, final payment will be made by the University of Washington.

PART 4 DEFINITIONS

- **Apical Control**- Inhibition of the growth of lateral branches by the terminal (central leader) over many seasons growth, or during its entire lifetime. Characteristic of trees with excurrent form.
- **Apical Dominance** - Growth of a terminal shoot meristem(s) at the expense of lateral shoots below them whose development they inhibit within a particular growing season.
- **Branch Bark Ridge** –The raised area of bark developing on the top side of the junction where two branches meet; this is a normal and desired pattern of development in contrast to included bark.
- **Branch Collar** - The swollen area developing at the base of a branch where it joins the trunk or a larger limb. The branch collar is often referenced for proper pruning cuts.
- **CODIT** - Stands for compartmentalization of decay in trees; CODIT is a model describing how trees react to wounding or injuries.
- **Codominant** - Two or more vigorous and upright branches of relatively equal size that originate from a common point, usually where the leader has been lost or removed.
- **Crown** - The aboveground part of the tree including the trunk and limbs.
- **Cultivar** - A named plant selection from which identical or nearly identical plants can be produced, usually by vegetative propagation or cloning.
- **Decurrent** - trees that lack a strong central leader, typical of many deciduous tree species.
- **Disease** - A fungus or infectious organism that impairs the physiological functioning of the tree.
- **Excurrent** - trees that have a strong central leader; typical of many conifer species.
- **Fertilizer** - Any organic or inorganic material that is added to the soil to contribute to or increase soil nutrients for the growth of plants.
- **Flush Cut** - An inappropriate pruning cut of a lateral branch in which the branch collar and/or trunk tissue is removed.
- **Girdling root** - A root that partially or entirely encircles the trunk and/or buttress roots, which could restrict growth and downward movement of photosynthate and/or water and nutrients up.
- **Included bark** - Bark embedded within the crotch between a branch and the trunk or between two or more stems that prevents the formation of a normal branch bark ridge. This often occurs in branches with narrow-angled attachments or branches resulting from the loss of the leader. Such attachments are weakly attached and subject to splitting out.
- **Kinked root** - A primary root(s), which is sharply bent, causing a restriction to water, nutrients, and photosynthate movement. Kinked roots may compromise the structural stability of root systems.
- **Leader** - The dominant stem which usually develops into the main trunk.
- **Mulch** - A material that is spread on the surface of the soil to protect the soil and plant roots from the effects of raindrops, soil crusting, freezing, and evaporation.
- **University of Washington Representative** – Individual identified as representing the University of Washington with the duty of enforcing this document.

- **Pests** - Refers to any organism that is destructive or compromises the health of a tree; including insects, animals, fungi, conks, and cankers.
- **Photosynthate** - Pertains to sugar and other carbohydrates that are produced by the foliage during photosynthesis, an energy trapping process.
- **Root collar** - The flared area at the base of a tree where the roots and trunk merge. Also referred to as the “root crown” or “root flare”.
- **Scaffold branches** - Large, main branches that form the main structure of the tree.
- **Shall** - Used to denote a practice that is mandatory.
- **Should** - Used to denote a practice that is recommended.
- **Soil Texture** - The proportion of primary soil particles (sand, silt, clay) in a soil.
- **Soil Structure** - The arrangement or combination of primary soil particles (sand, silt, clay) into larger secondary particles or units.
- **Soil pH** - The measure of the acidity or alkalinity of a soil.
- **Temporary branches** - A small branch that is retained temporarily along the lower trunk of young trees. Temporary branches provide photosynthate to increase trunk caliper and taper and help protect it from sunburn damage and mechanical injury. Such branches should be kept small and gradually removed as the trunk develops.
- **Trunk** - The main stem or axis of a tree that is supported and nourished by the roots and to which branches are attached.

PART 5 ACKNOWLEDGEMENTS

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PART 6 REFERENCES FOR SPECIFICATIONS

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