CITY OF WOODINVILLE

TREE BOARD PACKET

August 28, 2013

CITY HALL COUNCIL CHAMBERS
17301 133RD AVENUE NE
WOODINVILLE, WASHINGTON 98072

CITY OF WOODINVILLE
TREE BOARD AGENDA
REGULAR MEETING WEDNESDAY, AUGUST 28, 2013 5:30 PM

• Jey Manickam • Thomas L Quigley • Michael Munniks • Paula Waters • Steve Yabroff

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5:30 **CALL TO ORDER**

5:31 **ROLL CALL**

5:33 **APPROVE AGENDA IN CONTENT & ORDER**

5:35 **PUBLIC COMMENTS**

BUSINESS AND DISCUSSION ITEMS

5:40 **1. Approval of July 24, 2013 Minutes**

5:45 **2. Review of Tree Regulations and Proposed Recommendations**

6:20 **PUBLIC COMMENTS**

6:25 **DIRECTOR'S REPORT**

6:30 **ADJOURNMENT**

(Note: The agenda may be rearranged or changed at the beginning of the meeting, with a consensus of Tree Board members present.)

Issue Date: August 21, 2013
Staff Contact: Sarah Ruether, Planner

Faxed to:	**News Media**
E-mailed to:	**Tree Board**
Publish:	**Not published**
Post:	**1) In-House, 2) Post Office & 3) Website**

CITY OF WOODINVILLE, CITY COUNCIL CHAMBERS
17301 133RD AVE. NE, WOODINVILLE, WA 98072

NEXT REGULAR MEETING SEPTEMBER 25, 2013, 5:30 PM

AGENDA ITEM 1

City of Woodinville, Washington

TREE BOARD REGULAR MEETING MINUTES OF JULY 24, 2013

Woodinville City Hall City Council Chambers, 17301 133rd Avenue NE, Woodinville, WA

CALL TO ORDER	The regular meeting for the Woodinville Tree Board was called to order at 5:30 p.m. by Chair Quigley.
ROLL CALL	Tree Board Present: Chair Quigley, Board Member Waters, and Board Member Yabroff. Board Member Munniks arrived at 5:35 p.m. Absent: Board Member Manickam. City Staff Present: David Kuhl, Development Services Director, Sarah Ruether, Planner, and Sandy Guinn, Sr. Administrative Assistant **MAIN MOTION: to excuse Board Members Manickam and Munniks.** **Motion by: Board Member Waters** **Second by: Board Member Yabroff** **Action for the Main Motion: PASSED 3 - 0** **Vote: Ayes: Chair Quigley and Board Members Waters and Yabroff** **Nayes: None.** **Abstain: None.**
APPROVAL OF AGENDA ORDER AND CONTENT	Chair Quigley noted there was consensus to make no changes.
PUBLIC COMMENTS	None.
BUSINESS AND DISCUSSION ITEMS	
Approval of April 17, 2013 Special Tree Board Minutes	1. Approval of May 22, 2013 Regular Tree Board Meeting Minutes Tree Board approved the regular meeting minutes of May 22, 2013, as presented. **MAIN MOTION: to approve the special meeting minutes of April 17, 2013, as presented.** **Motion by: Board Member Waters** **Second by: Board Member Yabroff** **Action for the Main Motion: PASSED 3 - 0** **Vote: Ayes: Chair Quigley and Board Members Waters and Yabroff**

	Nayes: None. **Abstain: None.**
Discussion and Review of Tree Regulations and Proposed Recommendations	2. Discussion & Review of Tree Regulations and Proposed Recommendations Discussion started with Commissioner Yabroff's discovery of diseased trees on his property, his submittal of a Tree Removal application on Monday, and the process whereby applicants are notified that their Tree Removal permit has been issued. Planner Ruether advised that normally the Permit Technician would call the applicant; however, since the Tree Board was meeting today, Ms. Ruether said she would advise Commissioner Yabroff that the Tree Removal permit was issued. Commissioner Yabroff recommended that how an applicant is notified should be added to the Tree Removal Permit Decision Tree. The Commissioners discussed how to encourage citizens to take care of diseased trees when the disease could spread to other trees (e.g. need to remove tree from property). One of the issues with current tree regulations is the requirement that a diseased tree that needs to be felled in a Native Growth Protection Area (NGPA) may not be removed from the NGPA. The Commissioners expressed that a break on the amount of tree credits should be given to a citizen when diseased trees (where disease may be spread to nearby healthy trees) are removed. The rational for this is that removal of large trees are expensive and there are circumstances where a tree should not be replanted for a period of time (e.g. fungus). Planner Ruether said she would propose revised language to address diseased trees in the NGPA and how to encourage citizens to remove diseased trees. There was further discussion on how to write code so that the current tree goals are not diluted while the code is rewritten to be more applicable to what is actually occurring; e.g. the spreading of disease when a diseased tree is not removed. Commissioner Waters expressed one possibility could be to give more discretion in the code to the Development Services Director, provided an Arborist Report is required as staff needs science to make decisions defensible. Director Kuhl responded to questions from Tree Board members regarding recent felling of trees and if permits were first obtained. Director Kuhl commented on the projects that did have permits and what the City was doing regarding the situations where no permits were obtained. Commissioner Munnicks asked what portions of the City's code was reviewed for the Canterbury Square project. Planner Ruether commented that the City reviews a large development in the Central Business District (CBD) for both tree regulation requirements and landscaping requirements. Ms. Ruether talked about the 40% canopy and the 2009 detailed analysis performed by the UW students and that the City's tree goals should be based on this study. Tree Board members discussed deleting tree regulations from the CBD and Industrial (I) Zones and using strictly the landscaping code in these areas, provided the code is written to ensure

	that there shall be no net loss of tree canopy coverage. Planner Ruether advised that she will research what other cities have for landscaping code and their incentives; e.g. % of native vegetation in the CBD and I Zones or applicant may get a little more height when green roofs with structured parking is used. After the Tree Board reviews the researched information, the next step for the Tree Board is to make recommendations to City Council. The members stressed that the revised code should not create loopholes that allows for unnecessary tree removal and that the over-all 40% tree canopy coverage should be maintained, with 50% tree canopy coverage in residential. Chair Tom Quigley explained the 12 point risk factor (as adopted by ISA) and that any tree above 9 points should be felled. Tree Board members were supportive of the Director using the 12 point risk factor, provided an Arborist Report was submitted. There was dialogue regarding the current code requiring only a certain number of trees to be removed each year versus removing many trees in one year and then no removal of trees for a certain number of years (tree management plan). Tree Board member Yabroff said there should be a middle ground where citizens want to honor what the goal is and not have citizens throw their hands up. Planner Ruether said she would bring back provisions creating future tree credits; provisions for diseased trees that are likely to infect other trees or trees that have a high risk factor, including poor structured trees that should be felled. Chair Quigley asked who is responsible for the routine pruning and how is it decided what to maintain. Planner Ruether advised Public Works provides the maintenance in the public right-of-way and on public property; however, there has been difficulty in finding seasonal help. Ms. Ruether said she would find out more information regarding maintenance for the next meeting. Tree Board member Munniks commented that Wilmot Gateway Park is in great shape. Chair Quigley asked how the current tree funds are used. Director Kuhl commented that he believes the funds will be used for the Gateway landscaping, and, at the next meeting, we could talk about what to do with current tree funds and make a recommendation.
PUBLIC COMMENTS	None.
DIRECTOR'S REPORT	Director Kuhl reviewed the existing tree violation in the Lower/Upper West Ridge area and mentioned he hoped to meet with the violator next week to complete the process. An arborist has made a recommendation and we need to work out the number of tree credits that need to be replaced. He also recommended that guests are allowed to participate and have five (5) minutes to present their ideas or comments. They should be required to sit in the audience and not at the table with the Board.
ADJOURNMENT	Chair Quigley called the meeting adjourned.

	The meeting was adjourned at 6:28 p.m.

Sandy Guinn
Sr. Administrative Assistant

AGENDA ITEM 2

CITY OF WOODINVILLE, WA

REPORT TO THE TREE BOARD

17301 133rd Avenue NE, Woodinville, WA 98072
WWW.CI.WOODINVILLE.WA.US

To:	Tree Board	**Date:**	August 28, 2013
From:	Dave Kuhl, Development Services Director		
By:	Sarah Ruether, Planner		
Subject:	Review of Tree Regulations and Proposed Recommendations		

ISSUE: Shall the Tree Board review the Current Tree Code and Proposed Recommendations for Changes to the Code?

STAFF RECOMMENDATION: To review and consider proposed changes as part of the Tree Board's work plan for 2013.

POLICY DECISION: The Tree Board provides an advisory role to the City Council on matters of trees and urban forestry.

BACKGROUND/ANALYSIS:

Tree Canopy Coverage Goals

In the previous Tree Board meeting the tree canopy coverage goals for the City were discussed. The Tree Board agreed that the tree canopy coverage goals be customized based on the existing tree canopy coverage and the amount of tree canopy that the existing zoning could support. In the lower density areas of town, (Reinwood and Leota) tree canopy coverage is over 50% based on the 2009 Study. For this reason, it is reasonable to have a large tree canopy coverage goal for residential properties. An overall, tree canopy coverage goal for all residential properties at 50% would retain the existing healthy tree canopy. Some residential areas would have a higher tree canopy coverage and some less, but the goal would be for an overall residential tree canopy coverage of 50%. The downtown tree canopy coverage is 19% and Industrial properties have an 11% tree canopy coverage. For this reason Staff recommends an18- 20% tree canopy coverage goal for commercial properties. This tree canopy coverage goal would maintain the existing tree canopy coverage and make a goal for a little bit higher tree canopy coverage for industrial properties.

Exemptions for Diseased Trees and Soil

The problem of removing diseased trees, especially when a fungus or disease requires multiple trees be removed and the soil left to recover without immediate planting, was discussed. Related to this are the problems of an overplanting and tree spacing. Snohomish County, in July of 2013, considered an amendment to their tree ordinance to " require replacement trees to be planted in accordance with best management practices for landscaping to ensure long-term health and survival of the trees". A provision for best management practices to allow for tree removal and an exemption from replanting based on best management practices has been added for proposed code change.

WMC 21.15.030 Exemptions.

The following activities are exempt from the provisions of this chapter:

(1) Emergency Tree Removal. Any tree on private, developed property that poses an imminent threat to life or property, due to a storm event such as a wind storm or ice storm, may be removed without first obtaining a permit. The party removing the tree will contact the City within seven days of removal to provide documentation of threat for approval of exemption. If the City Tree Official determines that the emergency tree removal was not warranted, he or she may require that the party obtain a permit and/or require that replacement trees and vegetation be replanted as mitigation, in accordance with WMC 21.15.120(8)(b).

(2) Dead Tree Removal. Any tree on private, developed property that from a cursory visual inspection can be determined to be fully dead by a layman without any arborist training, may be removed without first obtaining a permit. The party removing the tree will contact the City within seven days of removal to provide documentation of the deceased tree, and if known, the cause of death. If the City Tree Official determines that the dead tree removal was not warranted, he or she may require that the party obtain a permit and or require that replacement trees and vegetation be replanted as mitigation, in accordance with WMC 12.15.120 (8) (b).

(2) Utility Management. Trees may be removed by the City or utility provider in situations involving immediate danger to life or property, or interruption of services provided by a utility.

(3) Commercial Nurseries or Tree Farms. A nursery or tree farm owner may remove trees that are being grown to be sold as Christmas or landscape trees.

(4) Removal of nonsignificant trees with a diameter-at-breast-height of less than two inches.

(5) Trees within the public right-of-way shall be subject to the requirements of Chapter 2.24 WMC. (Ord. 481 § 11 (Att. F), 2009; Ord. 478 § 1 (Att. 1), 2009)

(6) If best management practices determined by an ISA certified risk assessment arborist recommend that due to diseased soil, or other pest infestations, that the full tree credits required to be planted be delayed or not replanted for a specified period of time, this will be permitted at the discretion of the City Tree Official; in order to ensure the long-term health and survival of the trees in the vicinity and to prevent the spread of disease. Alternative compliance may be required at the discretion of the City Tree official; and, replacement trees may be planted on another site approved by the City Tree Official, when a certified arborist finds and the City Tree Official concurs, that replacing trees on the original site will result in increased likelihood of the trees not surviving.

Urban Design to Promote a Healthy Urban Forest

It is harder to reach the same level of tree canopy coverage in urban areas due to development. However, the benefits of an urban canopy, from cleaner air to crime reduction, are very important to the environmental health and livability of the City. Quick facts pulled of the City of Tacoma urban forestry website tell the story of why an urban tree canopy coverage is so important.

Quick Facts from City of Tacoma Urban Forestry Website:

- Trees reduce runoff and erosion from storms by about 7% and reduce the need for erosion control structures. In urban areas with trees, the use of smaller drain pipes can save cities on materials, installation and maintenance.
- The net cooling effect of a young, healthy tree is equivalent to 10 room size air conditioners operating 20 hours a day.
- Trees in Davis, California, parking lots reduced asphalt temperatures by as much as 36 degrees Fahrenheit, and car interior temperatures by over 47 degrees Fahrenheit.
- Trees in urban parks and recreation areas are estimated to improve outdoor leisure and recreation experiences in the United States by $2 billion a year.
- Trees reduce crime. Apartment buildings with high levels of greenery had 52% fewer crimes than those without any trees. Buildings with medium amounts of greenery had 42% fewer crimes.
- Americans travel about 2.3 billion miles per day on urban freeways and highways. Studies show drivers exposed to roadside nature scenes had a greater ability to cope with driving stresses.
- Trees reduce noise pollution by absorbing sounds. A belt of trees 98 feet wide and 49 feet tall can reduce highway noise by 6 to 10 decibels.
- Philadelphia's 2.1 million trees currently store approximately 481,000 metric tons of carbon with an estimated value of $9.8 million.
- Hospital patients recovering from surgery who had a view of a grove of trees through their window required fewer pain relievers, experienced fewer complications, and left the hospital sooner than similar patients who had a view of a brick wall.
- If you have a chance try out the National Tree Benefits Calculator http://treebenefits.com/calculator/, which is a tool based on i-Tree assessments. The Tree Benefit Calculator is intended to be simple and accessible. As such, this tool should be considered a starting point for understanding trees values in a community, rather than a scientific accounting of precise values.

Promoting and protecting tree canopy in an urban area is a much different task than in a residential or open space type property. The problems of sidewalks, streets and other impervious surfaces are part of the landscape of an urban environment and this infrastructure makes it difficult to plant and ensure the survival of trees. Therefore, our code needs to be mindful of this and find new and innovative ways to make sure that our urban canopy be maintained and increased through careful incentives and planning as the city grows and redevelops. A publication from the University of Florida in Attachment B: Urban and Design for a Wind Resistant Urban Forest does a good job of illustrating some of the common problems in planting an urban forest. While the northwest does not have hurricanes, there are very good lessons in this publication on understanding good design for urban forests. Many of the suggestions in this article are based on designing landscaping that supports better root systems for trees. As we move forward with the landscaping code, making sure that our code supports the right planting area and the right tree for the urban landscape is important. Ways to accomplish this may be to give credit for installing a different surface material for planting space like stone dust, permeable pavers, suspended sidewalks, structural soil, and planting strips. These techniques are all ways to provide an environment for healthy roots and larger planting spaces for urban trees.

Sustainable Approach to Designing Parking Lots

Planting trees in groups is a technique that the article on Urban Design for a Wind Resistant Urban forest suggests and this also relates to the suggestions for a sustainable approach to

designing parking lots. This approach advocates grouping trees together to allow for a greater area for soil and plantings, which also allows for more shade. As we consider changes for the code, how does the code support the preservation of large Type I trees, and prevent too many smaller trees, that are isolated and that have small growth potential. The City of Tacoma gives credits for different aspects of how an applicant contributes to tree canopy. As we move forward on modifications to the landscaping code, how do we provide the flexibility that is required for developing in an urban environment while, also, providing incentives to encourage as much tree canopy as possible?

City of Tacoma Urban Forestry Manual

Portions of the City of Tacoma DRAFT urban forestry manual are attached as Attachment C and Attachment D. This manual was chosen as an example because it uses some of the techniques described above for structural soil amendment, pervious pavers and green building techniques as part of it's credit system for its landscaping code. Incorporating ways to encourage development to plant urban trees that can be larger and more viable should be incentivized in the code. Other ways to add planting to an urban area like green roofs and vertical gardens should be considered for the landscaping code.

Tree Protection Measures for the Urban Forest

One of the best ways to protect the urban tree canopy is to preserve, as best as possible, the existing tree canopy. The City of Tacoma DRAFT urban forestry manual does a good job of providing infrastructure standards and publication notices to protect trees during construction. While Woodinville has these tree protection measures in our code, having graphics with specifications to be included as part of our infrastructure standards would strengthen tree protection plans. See attachment D City of Tacoma Tree Protection Standards for examples of details for tree protection. Included is a notification sheet to be placed on any tree to be saved during construction. This public notice for trees to be saved during construction is, also, done in the City of Seattle. This notification provides incentive for accountability and allows citizens who pass by to help in enforcement of tree protection measures.

RECOMMENDED ACTION:
REVIEW PROPOSED OPTIONS AND MAKE RECOMMENDATIONS

Attachment A: Snohomish County allowance for Off-Site Replacement
Attachment B: Urban Design for a Wind Resistant Urban Forest
Attachment C: City of Tacoma Urban Forestry Manual
Attachment D: City of Tacoma Tree Protection Standards

Attachment A: Snohomish County allowance for Off-Site Replacement

Snohomish County Council

Committee: Planning & Community Development **Analyst:** Will Hall

ECAF: 0707 **Date:** July 2, 2013

Summary

Motion 13-251 would refer a proposed ordinance to PDS and the planning commission. The proposal would allow off-site tree replacement or payment of a tree replacement fee if required replacement trees do not all fit on the site of a project.

Background

On January 21, 2009, the Snohomish County Council adopted Amended Ordinance No. 08-101, adding tree replacement requirements in Snohomish County Code (SCC) section 30.25.016.

The current regulations require retention of nearly all significant trees in perimeter landscaping areas, on-site recreation space, and critical area protection areas and buffers. Other significant trees can be removed but they must be replaced at a ratio of 1:1, 2:1, or 3:1 depending on the size of the tree that is removed.

It can be difficult or even impossible to replace trees on some sites, especially sites that are heavily forested, without packing them so closely together that they would not survive. The current code includes the following provision to allow off-site replacement of trees:

> "replacement trees may be planted on another site in the immediate area approved by the director when a certified arborist finds, and the director concurs, that replacing those trees on the original site will result in increased likelihood of the trees not surviving" (SCC 30.25.016(7)(a)).

Add for hazardous/ diseased tree provision to code?

Developers have expressed concern about the implementation of the tree replacement requirements and the impact that on-site tree replacement requirements can have on potential projects. Planning and Development

Attachment A: Snohomish County allowance for Off-Site Replacement

Services did not include tree regulation amendments on the PDS work plan, so the draft legislation attached to this motion was prepared by council staff.

There are many different examples of tree retention and replacement requirements in other jurisdictions, including some that allow replacement of trees off-site and some that allow a fee to be paid in lieu of tree replacement. Council staff reviewed several such codes, including from Brier, Lynnwood, and Redmond. PDS staff prepared a table listing some of the tree requirements in other jurisdictions.

The draft ordinance would make the following changes to SCC 30.25.016:

1. It would delete the current language requiring replanting on-site or on another site in the immediate area approved by the director when a certified arborist finds that replacing them on the original site would decrease tree survival. Problems with the implementation of that language are what led to this draft legislation.
2. It would require replacement trees to be planted in accordance with best management practices for landscaping to ensure the long-term health and survival of the trees. Best management practices for spacing of trees, which varies by species, size, and site conditions, will limit the number of trees that can be replanted on some sites. There are a number of resources available to landscape professionals to determine tree spacing.
3. It would add a specific requirement for replacement trees to be planted on-site to the extent that the site can accommodate them consistent with best management practices for landscaping, as determined by the director. Since SCC 30.25.015(2)(b) requires landscaping plans to be prepared by a qualified landscape designer, the director's determination would be based on a review of that work by a landscape professional.
4. It would allow trees that cannot be accommodated on-site to be replaced either off-site or through a tree replacement fee. All replacement costs are the responsibility of the applicant. Off-site replacement could be on county property, city property, or even private property, as long as agreements are in place to ensure the long-term maintenance of the replacement trees. The tree replacement fee is not specified in the draft legislation. It could be set by rule, approved by the director based on information provided by applicants, or added to the legislation by PDS or the planning commission once the replacement cost is determined.

Require best management practices for re-planting and removal of trees, per item two. Also use this as an allowance for leaving a site unplanted while soil is recovering from disease and infestation

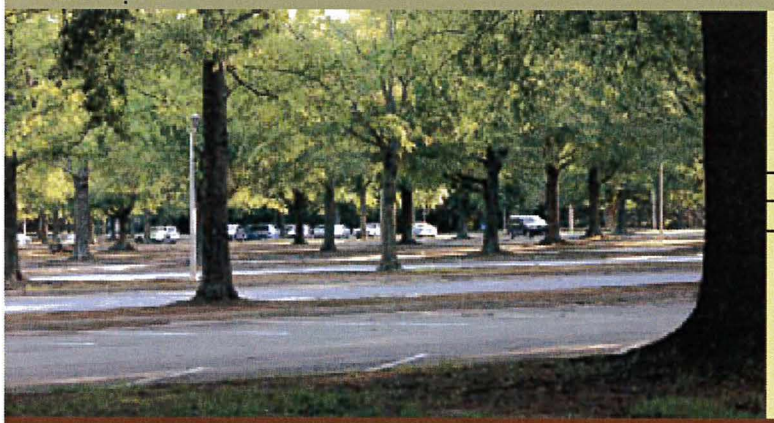
Substantive amendments to the development regulations require review by the planning commission and other procedural steps by PDS. Motion 13-251 would refer the draft ordinance to PDS and the planning commission for consideration. Chapter 30.73 SCC gives the planning commission up to 90 days to hold a hearing when Council initiates legislation.

Action Requested: Move to GLS on July 10 for action.

Attachment B: Urban Design for a Wind Resistant Urban Forest

CHAPTER 6

URBAN DESIGN FOR A WIND RESISTANT URBAN FOREST



PUBLICATION N°
ENH 1056

EDWARD F. GILMAN
TRACI PARTIN

UF UNIVERSITY of FLORIDA IFAS Extension

Introduction

Researchers who visited post-hurricane sites found that many incidents of tree failure could have been prevented with appropriate design and management. Many trees that grow to a large size had been placed too close to curbs, sidewalks, foundations, and pavement. Roots on mature trees had been deflected, decayed or been cut close to the trunk. These conditions resulted in trees toppling in high winds.

A strong root system is one of the most critical factors that allow trees to withstand hurricane-force winds in urban landscapes, where space for root growth is often limited. Limited rooting space presents a challenge to creating sustainable landscapes. Strategies for developing strong root systems on newly planted trees and preserving the roots of existing trees will be discussed in this document. Other elements of wind-resistant design such as tree grouping and species selection will also be introduced.

Research shows that the more rooting space trees have, the less likely they are to fall. Root systems that grow without being deflected by curbs, sidewalks, pavement and other urban soil structures have a chance to develop a strong supporting base for the tree. Main roots close to the trunk should be straight.If these roots are deflected or cut during construction, then risk of failure increases significantly. Trees growing in groups have a higher rate of survival than trees that stand individually. Groups of trees also divert wind so they offer more protection for nearby buildings compared to isolated trees. See *Chapter 5—Wind and Trees: Lessons Learned from Hurricanes* for more details on the design factors that have affected tree failure in past hurricanes, based on the research and observations of experienced professionals.

Good design means designing the underground soil space to support trees and selecting the right tree. However, many landscapes are already established. So it is important to first address design solutions for existing situations where trees are in conflict with the landscape.

Existing Design Situations

Every day people pass by trees that are growing in conflict with the existing landscape: the parking lot of the grocery store, the sidewalks downtown, the front yards of their homes, and so on. In each of these situations, when trees have a limited space to grow, pavement begins to interfere with root expansion 10 to 20 years after planting (Figure 1). The problem can begin as a crack in the surface of the pavement, which attracts growing roots and eventually results in an entire section being lifted. This can present a trip hazard to pedestrians passing by. Large maturing trees grown in small spaces will do one of two things: grow and disturb the hardscape, or decline and eventually

die. The latter outcome is wasteful and impractical because the cost of planting a tree in an urban area can range from five hundred to thousands of dollars. Tree removal and replanting is yet another expense, and still the design objective is not fulfilled. In the former scenario, in which the tree continues to grow in conflict with the hardscape, often the large anchoring roots are cut when the hardscape is repaired (Figure 2). Many urban tree managers have learned from experience that cutting roots is a poor decision because it makes the tree unstable. Trees with cut roots have fallen over and damaged homes and vehicles. They have even killed people. It should be clear that for the sake of wind resistance, cutting or damaging the root system that anchors the tree is not an option! Trees that lack their main support roots are hazards in the landscape.

When root pruning is necessary, the general guideline is to preserve all roots within an area about five times the trunk diameter. For example, if the trunk diameter is two feet, than do not prune roots within ten feet of the trunk. Although this will not guarantee that tree will remain erect, it is better than cutting closer to the trunk.

Figure 1

Sidewalk located too close to the root flare of a large tree.

Figure 2

Main supporting roots were cut. These trees, once of value to the landscape, are now at high risk for failure and should be removed before they fall over.

Design solutions for situations where roots are in conflict with the landscape

Rather than cutting the roots, there are many different techniques that have been used that do not interfere with the root system of the tree. Several of these are discussed below. Look for more detailed information on our Web site: http://treesandhurricanes.ifas.ufl.edu/.

Install different surface material

Materials other than concrete can be used as a wearing surface for sidewalks. Some examples are crushed granite, gravel, wood decking, brick-in-sand and asphalt. Porous pavers and porous asphalt have been used for parking lots with success. A potential benefit to these alternate surface materials is that they provide some aeration to the soil beneath, versus concrete, which traps moisture and can encourage roots to grow directly under and break the pavement. Most of these materials are flexible, so they are less likely to crack from root growth than a rigid surface like concrete. Repairing these alternate surface materials can also be less expensive than traditional hard surfaces.

Stone dust

Surface materials like gravel, limestone, or stone dust allow continued root growth and expansion (Figure 3). The surface can be easily repaired as roots continue to expand in diameter. Crushed rock is inexpensive and easy to install, and the surface is porous. It is best used on fairly flat surfaces because rain can cause erosion on sloping ground. The use of brick pavers, shown in the picture, provides a route for pedestrians walking from the parking lot to the other side of the street. Displaced stones will need to be replaced occasionally, and may be a nuisance when using equipment such as a leaf blower (Gibbons, 1999).

photo courtesy of Scott Wheeler

Figure 3

Stone dust is placed around the root flare of the tree in cutouts along this brick sidewalk. This technique is attractive and allows for easy repair as roots expand in diameter.

Porous pavers

This solution is most commonly used for paved areas such as parking lots (Figure 4). Porous surfaces are a good idea for areas prone to flooding because they allow some water to permeate for more even distribution, and can help reduce runoff problems. This is an especially important design detail for Florida and the Gulf coast, which is prone to heavy tropical rains.

Soil should be added around the roots to prepare a base for the pavers. Coarse sand works nicely as a sub-base for the porous pavers because it compacts, yet allows enough air space between particles for air movement. Be sure that the soil grade is not lowered during the construction process, because this will damage roots.

Fill and re-pour sidewalk

Like many of the other solutions, this can be a short-term solution that often requires repair in the future. Perhaps using an alternate sub-base material like gravel or rubber chips (instead of soil) and then re-pouring will prevent roots from growing directly under the pavement and lifting it. Reinforcing the concrete with rebar can extend the life of the sidewalk or driveway by forcing the expanding roots to lift the entire slab. This can prevent cracking because the root can deform and become flattened under the slab instead of lifting it.

Figure 4

Porous pavers can be installed around existing trees where roots have lifted the pavement or sidewalk. This makes it easy to repair damage in the future and can potentially reduce water runoff.

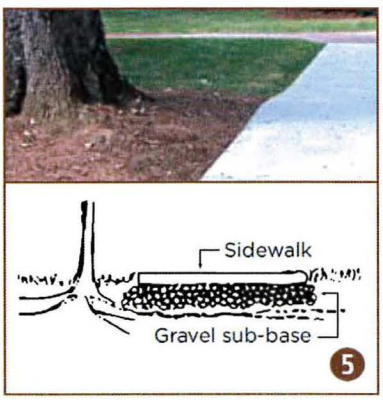


Figure 5

After adding soil over the roots that are causing the walk to lift, re-pour the sidewalk. Use a sub-base material like gravel, or reinforce the concrete with rebar to deter roots from lifting the pavement.

Bridging

Surface materials such as interlocking concrete pavers, wood decking, rubber sidewalks, or metal (Figure 6) can be used to bridge over roots.

Reroute

Where possible, redirecting the sidewalk is a great option if there is space (Figure 7). This solution is used for many trees in urban areas. Be sure to put a mechanism in place that prevents contractors from damaging the main support roots during sidewalk repair.

Figure 6

Materials such as metal can be used to bridge over roots that are lifting an existing sidewalk. The tree can be seen at the extreme top of photo.

Figure 7

When there is space available, re-routing the sidewalk is the recommended option.

New Design/Construction: Designing the Right Place

A good design should provide enough soil space to support root growth of the tree. The volume of soil required depends on the expected size of the tree. Unfortunately, many trees are squeezed into soil spaces that are large enough for the root ball at planting but way too small for future root growth. This is a main reason for poor growth and instability of trees in hurricanes. Current design practices will have to change significantly in order to give trees the appropriate amount of soil space. A typical design specification can call for a volume of 200 cubic feet of soil for trees, whereas 2,000 to 3,000 cubic feet would be an ideal amount. This is a drastic difference! The table and design solutions presented here attempt to strike a compromise between these two extremes.

Soil requirements

For situations where the planting area is surrounded by paved surfaces, Table 1 provides guidelines for the minimum amount of soil to provide based on tree size at maturity. There are two components to soil space: 1) the total soil volume needed to sustain a tree for a reasonable period of time, and 2) the open soil area needed immediately surrounding the trunk to accommodate trunk flare growth. *Open soil space* is soil that is not covered by a solid hard surface such as a sidewalk, pavement, or a building.

Table 1. Soil requirements for trees based on their size at maturity.

TREE SIZE AT MATURITY	TOTAL SOIL AREA*	DISTANCE FROM PAVED SURFACE
SMALL Height: shorter than 30 ft	10 ft x 10 ft	2 ft
MEDIUM Height or spread: lesser than 50 ft	20 ft x 20 ft	6 ft
LARGE Height or spread: greater than 50 ft	30 ft x 30 ft	10 ft

* Measurements for when rootable soil depth is 3 feet or greater. For soil less than 3 feet deep, smaller maturing trees are recommended.

The soil guidelines in Table 1 are minimum recommendations intended for good quality, well-drained soils. When the soil has limitations such as compaction, high water table, poor drainage, etc., either provide more space, or choose small maturing trees. Although these recommendations are significantly different from a typical specification, much more rooting space is necessary for trees to be more stable in the landscape and to be appropriately considered a wind resistant design.

Design solutions for urban situations where space is limited

There are many options for increasing soil area for trees in downtown landscapes, malls, and other urban situations where pavement is in very close proximity to the trunk. This section will list options for increasing soil area in this type of environment, or making better use of existing site soil.

Step 1—Plant trees in the open space available.

Study Figure 8 carefully—notice the large space provided for turf. Compare this to the limited size of the sidewalk cutouts that the trees are planted in. If planted in the open lawn, the trees have a better chance to become large, to provide shade for people using the space, and reduce cooling costs for nearby buildings. Instead, they will have a shorter lifespan due to the limited growing space. The tree grates shown in Figure 8 cause more harm than good. Don't use them, pavers are a better option.

Figure 8

Locate trees on the site so they have access to the most soil space. These trees would thrive better if planted in the open space on the right. Root paths or suspended sidewalks could increase access to rootable soil.

We are accustomed to seeing trees planted in a thin strip of lawn between the sidewalk and street (Figure 9). Sidewalks often become displaced and broken as roots expand in diameter. Not only is damage to the sidewalk from root expansion expensive to repair, but trees would be more stable if they were planted in the open space on the other side of the walk. This is a simple solution that can reduce incidences of trees blowing over. When fewer curbs surround the tree, the tree grows faster and has a more balanced root system. The tree becomes more stable because the root flare is able to fully develop without obstruction from the sidewalk and curb.

Step 2—If there is no open space, provide more rootable soil.

Sidewalks in high traffic, downtown areas must be designed to support emergency vehicle weight. Hence, the soil beneath the sidewalk is compacted to prevent settlement and cracking of the sidewalk. However, trees thrive best in loose, porous soil that encourages root growth. These two objectives—stable walks and loose soil for roots—typically conflict with each other unless we design the space appropriately. So how do you create a stable wearing surface and space for trees to grow?

Root paths

Root paths are narrow channels of loose soil that provide a small path for air that encourages root growth under pavement (Figure 10). A trenching machine is used to cut a trench through the compacted soil. Aeration mats are then placed in the trenches, which are backfilled with loose soil once the mat is in place. Roots tend to follow the paths because they provide a channel for airflow adjacent to the mat; roots follow the air. Encouraging roots to spread under the pavement can help to prevent roots from circling around in the small cutout in the sidewalk, which is a common cause for trees blowing over during hurricanes. This method is preferred over just providing a cutout or box of soil, though it does not significantly increase the amount of soil space.

photo courtesy of Chuck Lippi

Figure 9

Rather than planting in the thin strip of soil space between the sidewalk and street (top), plant trees in the open space on the other side of the walk (bottom).

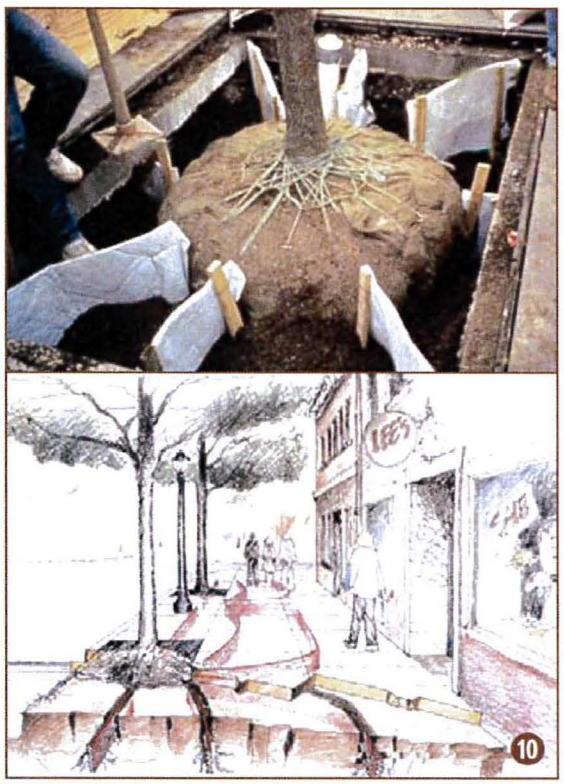


photo and illustration courtesy of Jim Urban, Urban and Associates

Figure 10

Root paths provide channels for air beneath the sidewalk to allow roots to spread beyond the planting pit.

Planting strips

Planting strips are long sections of soil without pavement on top that provide much more soil volume for trees than root paths. Notice the sidewalks bisecting the strips of turf in the right photograph (Figure 11). This is a necessary design consideration because it is important to keep pedestrian traffic off of the open soil around these trees to prevent soil compaction. Given this consideration, planting strips may be more practical in areas that are less busy. Planting turf and flowers at the base of the tree make it far more likely that the trees will receive adequate irrigation and could improve tree growth, though this may attract people to sit or walk on the turf. Never pile soil on top of the root ball or on the trunk.

Structural soil

Structural soil is designed to support the weight of walks, roads, pedestrians and vehicles, as well as provide a well-aerated soil substrate for tree root growth (Figure 12). In structural soil, weight is transferred from one aggregate (rock) to another, with enough soil to almost fill the space between the aggregates. The aggregates are angular rocks that are typically about 1 inch in diameter. Roots grow well in the soil between the aggregates, which is not compacted because load is transferred to the rocks.

This technique is being used in urban areas due to its effectiveness at supporting heavy traffic and allowing tree growth in tough urban situations. The process of mixing the soil can be labor intensive and needs to be done very carefully. Because 80% of the volume of structural soil is comprised of rocks, a large amount is needed to meet adequate root volume requirements.

Figure 11

Planting strips increases the soil area significantly, but the soil can become compacted in high traffic areas. Consider using paths to direct traffic (top). Planting in narrow strips (bottom) can cause walks to lift prematurely; gravel under the walk can help reduce sidewalk lifting

photo courtesy of Dr. Jason Grabosky, Rutgers University

Figure 12

Structural soil can be used beneath paved surfaces that bear heavy traffic. The weight on the surface is transferred to the rocks, while the soil between the rocks is not compacted and provides space for roots to grow. Soil typically represents about 20% of the volume of structural soil.

Suspended sidewalk

Sidewalk suspension or cantilever can allow a great deal of soil volume for trees and addresses the issue of compaction (Figure 13). There is no contact between the bottom of the sidewalk slab and the soil; the slabs rest on supports and pilings. This allows the planting pit to be filled with well-aerated, quality soil. Suspending the sidewalk avoids issues with soil compaction so that roots can spread without interrupting the hardscape. One product that has been recently introduced to the market, Silva Cells®, is an example of the suspended sidewalk technique.

Step 3—Plant trees in groups.

In addition to root space, a key design consideration for a wind-resistant landscape is to plant trees in groups (Figure 14). The definition for a grouping is five or more trees sharing the same soil space. The goal is to create a healthy urban forest with a mixture of young and mature trees that provides benefits such as canopy cover and protection from high winds. Damage to buildings and other structures is usually less severe on properties with high tree density than on properties with isolated trees spaced far apart.

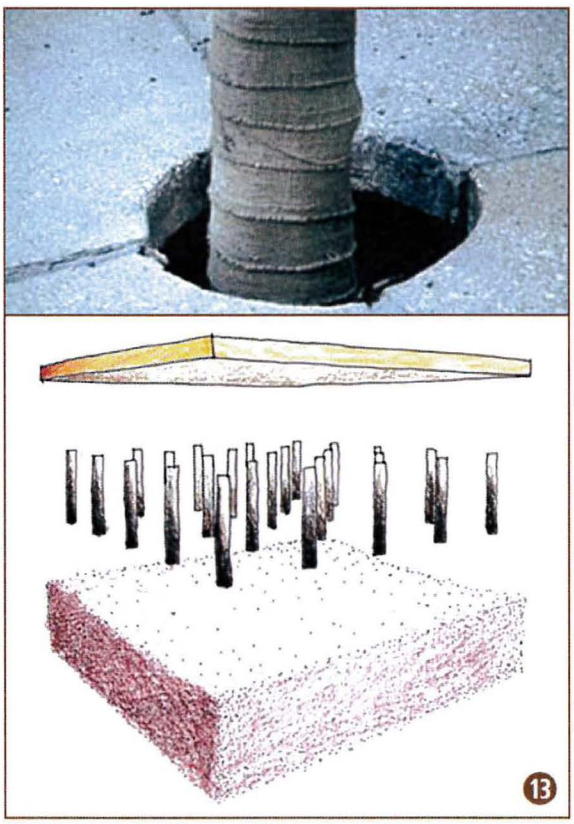


illustration courtesy of Jim Urban, Urban and Associates

Figure 13

Suspending the sidewalk on vertical supports stabilizes the walk and allows roots to grow well in uncompacted soil.

Figure 14

A historic neighborhood a few blocks from the downtown area of a small city has large trees due to large soil spaces (top). New trees positioned far apart in small soil spaces will take many years to form a canopy cover, if ever (middle). Merging soil into long wide strips allows roots to share space, resulting in successful urban designs (bottom).

A sustainable approach to designing parking lots

We have become accustomed to seeing large areas of land stripped to make a parking lot, and all the large trees clear cut to be replaced by a few small saplings. A more sustainable approach would be to evaluate the mature trees, remove the ones that are in decline or have poor structure or poor root systems, and design the parking lot around the existing, healthy trees. Replace the trees removed with groupings of young trees, rather than small islands that can only support one or two trees for a short period of time. Consider that large healthy trees, even if confined to one area, will shade a greater portion of a parking lot than lots of little islands with small, short-lived trees providing little to no shade. Trees in islands frequently have to be replaced and rarely fulfill the design intent.

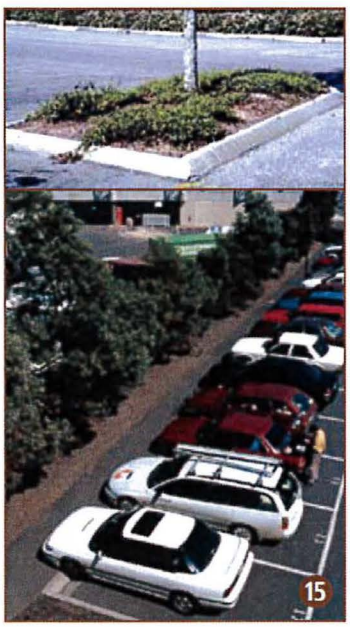


Figure 15

Contrast the typical planting island (top) where trees rarely become large with a buffer strip of trees (bottom). Grouping trees together in one large area is a sustainable design practice. These kinds of plantings will last many years.

New Design/Construction: Selecting the Right Tree

When soil space is limited, or the soil is shallow (less than 2 or 3 feet), rocky, or of poor quality, plant small maturing trees (those that mature at less than about 35 feet). There is an exciting variety of small trees that is currently underused for urban plantings but some of them are not available in large sizes. Although they are shorter than large maturing trees, small trees still provide some shade benefits (Figure 16). Rather than planting a large tree in a confined space, where much damage could occur from the tree blowing down during a hurricane, the preferred option is to go with the smaller tree which is more likely to survive a hurricane (see *Chapter 7—Choosing Suitable Trees for Urban and Suburban Sites: Site Evaluation and Species Selection*). Research has found that certain tree species, including many native species and palms, tolerate hurricanes (see *Chapters 8 and 9—Selecting Species for Wind Resistance*).

Figure 16

Small trees planted in a small space can help preserve the sidewalk but small trees provide very little canopy or shading unless planted close together as shown here.

Literature Cited

Gibbons, J. 1999. Pavements and Surface Materials. University of Connecticut Cooperative Extension System Technical Paper 8. Haddam, CT. 7 pp.

This document is ENH 1056, one of the Urban Forest Hurricane Recovery Program series of the School of Forest Resources and Conservation and the Environmental Horticulture Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date September 2007. Visit the EDIS Web site at http://edis.ifas.ufl.edu and http://treesandhurricanes.ifas.ufl.edu.

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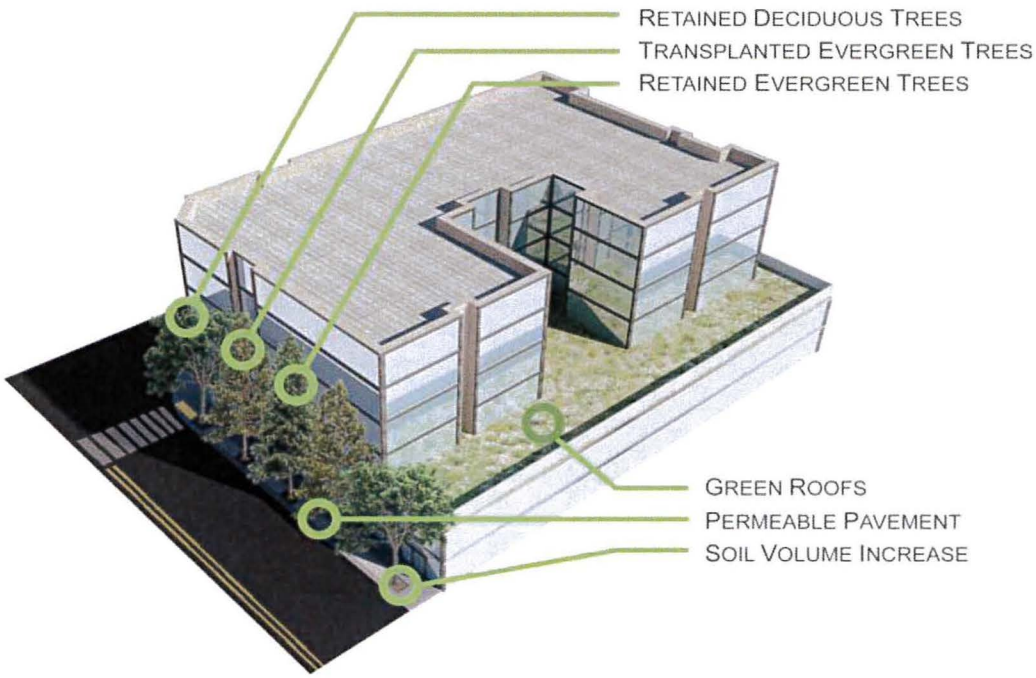
Attachment C: City of Tacoma Urban Forestry Manual

3.3 Canopy Cover Credit – Appendix 1, Page 4



In areas where growing enough trees to satisfy the canopy cover requirement is not feasible or practicable with the land use, credits may be applied. These credits are not a substitute for growing trees; they are intended to offer flexibility while still meeting the intent of a healthy and livable urban environment. Credit values have been determined based on best available science and best management practices to facilitate prolonged health and vigor of the urban forest.

3.3.1Retained Tree Credit

If protected properly, trees retained through development offer more immediate benefits to the urban forest than newly transplanted trees and are therefore a priority when feasible. An incentivized credit is offered for retained trees to reflect this priority. To be eligible for this credit, trees must be at least 6 inches in diameter at breast height (DBH) at the time of plan submittal. In addition, trees must be healthy and have minimal serious defects or defects that

cannot be mitigated by proper pruning as indicated on the Arborist Report and Tree Protection Plan.

An Arborist's report (Appendix 6), Tree Protection Plan (TPP) and subsequent tree protection measures consistent with Chapter 6 of this Volume are required for each tree proposed to be retained if canopy cover credit is desired.

Credit for retained, qualifying trees may be applied to all land uses and zones, and will be given in the following manner:

1. Deciduous Trees: 1 sq. ft. of retained deciduous tree crown = 1.25 sq. ft. tree crown to be applied to required canopy cover percentage.

2. Evergreen Trees: 1 sq. ft. of retained evergreen tree crown = 1.75 sq. ft. tree crown to be applied to required canopy cover percentage.

NOTE: Species considered invasive or ecosystem nuisances including, but not limited to, the following are not eligible for this credit:

- ***Ailanthus altissima* (tree of heaven)**
- ***Ilex aquifolium* (English holly)**
- ***Acer platanoides* (Norway maple)**
- ***Robinia pseudoacacia* (black locust)**
- ***Prunus laurocerasus / lusitanica* (cherry / Portugal laurel)**
- **Any previously topped trees**

3.3.2 Credit for Transplanting Evergreens

Scientific research shows that evergreen trees provide more consistent stormwater benefit to the urban environment than deciduous trees, due in part to their persistent foliage year round. Therefore, transplanting evergreens is preferred over deciduous trees in appropriate situations. A credit is offered to incentivize transplanting evergreens to reflect this benefit.

Credit for transplanting evergreen trees may be applied to all land uses and zones, and will be given in the following manner:

> 1 sq. ft. of transplanted evergreen tree crown = 1.5 sq. ft. tree crown to be applied to required canopy cover percentage.

3.3.3 Green Roof Credit

Green roof credit is offered to provide alternative solutions to meeting the ecological function of the urban forest when space or cultural limitations inhibit the ability to properly grow trees.

Credit for Canopy Cover using a green roof may be applied to all land uses in the following zones: Downtown, X-District, Commercial, and Industrial Districts. Credit for green roofs will be given in the following manner:

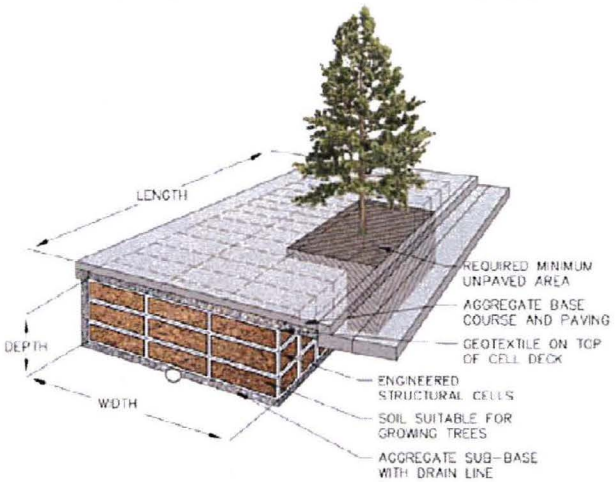
> 1 sq. ft. of green roof = 1.25 sq. ft. required tree crown to be applied to required canopy cover percentage.

NOTE: Green roof credit is limited to 75 percent or less of the required canopy cover for the entire development (ROW, Parking Area/Lot and/or Site).

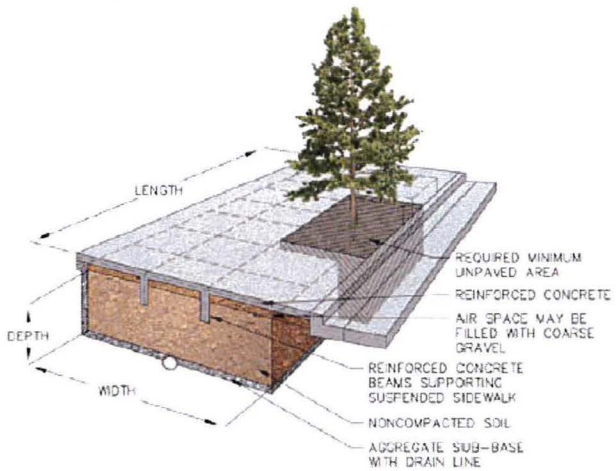
3.3.4 Soil Volume Increase Credit

Increasing tree root access to uncompacted soil or unpaved area in an urban forest contributes significantly to the ability for the tree to achieve its full potential size and function. Credit is offered for increasing soil volume by methods such as engineered structural cells or reinforced suspended pavement. Improvements must be in contact with the minimum unpaved area of a transplanted tree in parking areas/lots and/or street trees to receive this credit.

ENGINEERED STRUCTURAL CELLS



REINFORCED SUSPENDED PAVEMENT



Credit for canopy cover using a soil volume increase, is restricted to parking areas/lots and Street Trees in the following zones: Downtown, X-District, Commercial, and Industrial Districts.

Credit for soil volume increase will be given in the following manner:

> Medium and Large Trees: 1 cu. ft. soil volume increase = 1 sq. ft. required tree crown to be applied to required canopy cover percentage.

NOTE: Small Trees (with a crown width of 10 feet to 25 feet at maturity) are not eligible for this credit.

NOTE: Enlarging the unpaved area around a street tree or tree planted in a parking lot does not constitute an increase of soil volume and is therefore not eligible for this credit.

3.3.5 Permeable Pavement Credit

Limiting the amount of impervious material above the roots of a tree contributes significantly to the trees ability to achieve its full expected size and function. Credit is offered for using permeable pavement in contact with the minimum unpaved area and located within 25 feet of a transplanted tree trunk in parking areas/lots and for street trees.

Credit for canopy cover using permeable pavement and/or an increase in the minimum unpaved area may be applied only for trees transplanted in parking areas/lots and ROW in the following zones: Downtown, X-District, Commercial, and Industrial Districts.

Credit for permeable pavement or an increase in unpaved area will be given in the following manner:

> Permeable Pavement- pavers, porous concrete, increase in minimum unpaved area: 1 sq. ft. permeable pavement = 0.5 sq ft required tree crown to be applied to required canopy cover percentage.

3.3.6 In-Lieu Fees

If all attempts to satisfy the canopy cover requirements through transplanting and credits have been explored and it has been determined that the canopy cover requirements cannot be met in their entirety only then shall In-Lieu Fee(s) be accepted to satisfy any remaining canopy cover requirements. In order to demonstrate a reasonable effort, some amount of canopy must be provided on the site, excluding developments that entirely cover the site, and at least one credit must be employed. If In-Lieu Fees are authorized the fees will be in the following amounts:

Land Use	$ Per sq. ft. of Canopy Cover
1, 2 and 3 owner-occupied family residential uses	1.00
All other land uses	1.84

In-lieu Fee rates are based on the current market cost for the City to plant and maintain a 2-2 ½ inch caliper tree through the establishment period (the first three years). Canopy cover In-Lieu Fees will be deposited into the Urban Forestry Fund.

3.4 Calculating Landscaped Areas – Appendix 1, Page 5

This section of the Landscape Requirements Worksheet is intended to assist in determining the placement and quantities of required plants in Landscape Areas, such as Type PL (Parking Lot Perimeter), on the development site. For plant standards, descriptions and examples of the specific Landscape Area type requirements refer to Chapters 1 & 2 of this Volume, respectively.

3.5 Flow Control Credits= – Page 6, Appendix 1

When implemented in accordance with the criteria outlined in the Stormwater Management Manual (SWMM) Volume 3, Chapter 5, retained and newly transplanted trees are eligible to receive credit towards meeting flow control requirements. Arborist's Reports (Appendix 6), Tree

Attachment D: City of Tacoma Tree Protection Standards

CHAPTER 6: TREE PROTECTION DURING CONSTRUCTION

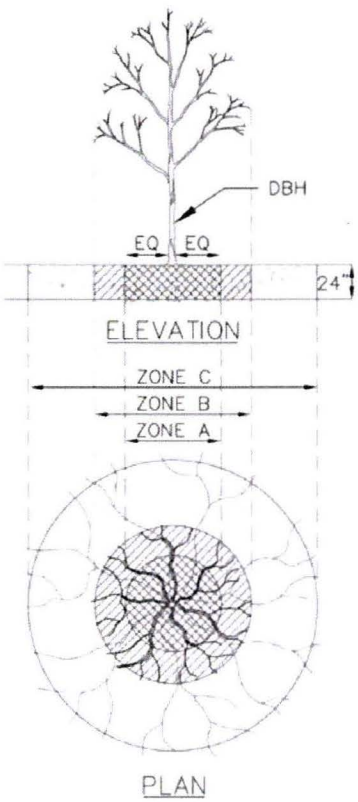
Urban trees need to be protected throughout their lives from damage to maximize their health, safety, benefits and functionality. Mature, young, and newly transplanted trees need protection from construction activities. Tree protection involves activities planned and designed to preserve and protect tree health by avoiding damage to tree parts such as the roots, trunk and crown.

If construction around trees isn't managed properly, tree health can be negatively impacted and sometimes even lead to the death of the tree.

This Chapter describes mandatory actions for construction activities around existing trees that are elected to be retained for canopy cover credits or Stormwater Flow Control credits. For more information on tree protection during construction, the following resources are suggested:

- Tree Protection on Construction and Development Sites- A Best Management Practices Guidebook for the Pacific Northwest
- American National Standards Institute (ANSI) A300 (Part 5) -Construction Management Standard
- International Society of Arboriculture Best Management Practices (BMP)- Managing Trees During Construction

6.1 TREE PROTECTION AREAS



(Zone A) Critical Root Zone (CRZ)

"Critical root zone" means the area under a tree whose radius measures 1 foot per 1 inch of diameter at breast height (DBH) from the trunk outwards and twenty-four inches in depth. For example, for a 10 inch DBH tree, the Critical Root Zone is located at least 10 feet out from the trunk and 24 inches deep.

Tree Diameter	CRZ radius	CRZ Diameter (including tree trunk)
2 inches	2 feet	4.5 feet
6 inches	6 feet	13 feet
20 inches	20 feet	42 feet
50 inches	50 feet	105 feet

(Zone B) Drip Line

"Drip line" means the area on the ground below the tree in which the boundary is designated by the edge of the tree's crown. For young trees, Zone A and B may be one and the same.

(Zone C) Feeder Root Zone

"Feeder Root Zone" means the area under a tree whose radius measures 2 feet per one inch of DBH from the trunk outwards and 24 inches in depth. For example, for a 10 inch DBH tree, the Feeder Root Zone is located at least 20 feet out from the trunk and 24 inches deep.

6.5 Working In the Tree Protection Zone – Protective Measures

While certain construction activities are limited or prohibited within the TPZ, it is recognized that some activities cannot be avoided. If any construction activities are to be conducted within the TPZ, the following protective measures shall be conducted.

6.5.1 Surface Protection Measures

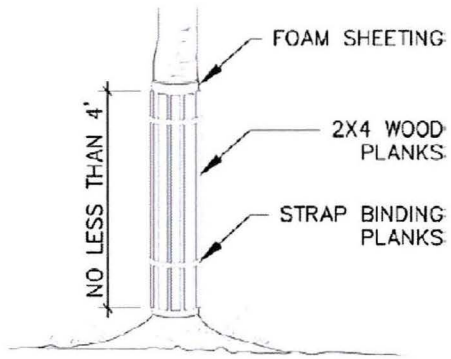
If traffic and construction activities cannot be kept out of the Tree Protection Zone for the entire duration of construction, actions shall be taken to disperse the vehicular load and/or surface compaction to protect the roots, minimizing root damage.

Surface Protection Measures include:

1) applying 6 to 12 inches of wood chip mulch to the area; or,
2) laying ¾-inch plywood or 4 x 4 wood beams over a 4+inch thick layer of wood chip mulch; or,
3) applying 4 to 6 inches of gravel over a taut, staked geotextile fabric; or,
4) Placing steel plates on top of a 4+inch thick layer of wood chip mulch; or,
5) Placing commercial or logging road mats on top of a 4+inch thick layer of wood chip mulch.

6.5.2 Trunk Protection Measures

If traffic and construction activities cannot be kept out of the TPZ for the entire duration of construction, actions shall be taken to protect the trunk from incurring damage.



Trunk Protection Measures Include:

Install 2 inch thick wood planks around the trunk of the tree with ¼" or greater closed-cell foam pads between the trunk and planks. The height of the wood planks shall be 4 feet minimum, or match the height of the proposed construction activities, whichever is greater. Use straps or wire to bind the planks in place. Do not drive fasteners into the tree. If the protective planks are to be in place for longer than 6 months adjust them every 3 months to allow for growth.

6.5.3 Supplemental Irrigation

If construction activities are conducted within the TPZ during the months of May through September supplemental irrigation, to include hand watering or another regular source of water, shall be provided. Trees shall be irrigated to provide at least 1 inch of water applied once a week directly to the root system using a slow delivery method to allow for adequate infiltration, and shall be identified on the work plan.

All trees elected to be retained through construction shall be monitored for signs of drought stress. Signs of drought stress include:

- Leaf curling or rolling
- Leaf drop
- Early fall color
- Dieback on leaders (esp. in conifers).

If signs of drought stress persist or worsen after providing regular irrigation, promptly notify the Urban Forester.

6.5.4 Canopy/Clearance Pruning

If canopy/clearance pruning is required to commence work, crown raising method of pruning shall be applied to achieve Tacoma's minimum clearance standards:

- 14 feet of vertical clearance the full width of streets and alleys
- 8 feet of vertical clearance for the full width of sidewalks

Where pruning of canopy for construction clearance above is not allowed; temporary tie-up of low limbs may be used.

6.6 Working In the Tree Protection Zone – Trenching / Excavation

6.6.1 General

Boring /Tunneling/Jacking is permitted in all Zones providing that:

1) All soil disturbance is at a minimum depth of 2 feet below grade;
2) The receiving / insertion point is not located within Zones A and B; and,
3) The diameter of the tunnel is not to exceed 6 inches.

6.6.2 Zone A (Critical Root Zone)

1) No disturbance allowed without site-specific inspection and approval of methods to minimize root damage, except in the case of tunneling / boring / jacking.
2) Severance of roots larger than 2 inches in diameter requires Urban Forester approval.
3) Tunneling is required to install lines 3 feet below grade or deeper.

6.6.3 Zone B (Drip Line)

1) Operation of heavy equipment and/or stockpiling of materials subject to Urban Forester approval, and require specific surface protection measures, refer to Section 6.5.1.
2) Trenching maybe allowed with strict adherence to the following:
   a. excavation by hand or with a hand-driven trencher may be required;
   b. trench width must be limited;
   c. no disturbance in Zone A is allowed; and,
   d. 2/3 or more of Zone B must be maintained in an undisturbed condition.
3) Tunneling may be required for trenches deeper than 3 feet.

6.6.4 Zone C (Feeder Root Zone)

1) Operation of heavy equipment and/or stockpiling of materials subject to Urban Forester approval, and may require specific surface protection measures, refer to Section 6.5.1.
2) Trenching is allowed with strict adherence to the following:
   a. excavation by hand or with a hand-driven trencher may be required;
   b. trench width must be limited;
   c. no disturbance in Zone A is allowed; and,
   d. 2/3 or more of Zone C must be maintained in an undisturbed condition.

For tree protection during construction standard plans, refer to Standard Plans L6.0, L6.1, L6.2 and L6.3 in this Volume.

6.7 Tree Protection Zone – Prohibited Construction Activities

The following activities within the Tree Protection Zone are prohibited:

- Dumping or storing materials such as building supplies, soil, waste items, vehicles or equipment;
- Parking or maneuvering vehicles;
- Excavating for utility or building construction;
- Constructing new paved surfaces; and
- Changing the grade.

Any landscaping done in the TPZ subsequent to the removal of the fencing shall be accomplished by hand operated equipment or, when not feasible to be done by hand, shall be conducted with the smallest equipment necessary.

6.8 Postconstruction Tree Monitoring

All trees retained through construction shall be monitored and maintained including mulching, irrigation and pruning where necessary, for the next 3 years following construction. Trees shall be inspected annually to look for changes in condition and signs of insects or disease. If symptoms persist or worsen, promptly notify the Urban Forester.

Ongoing protection activities following construction include:

- maintaining a mulched, grass-free area around the trunk to avoid damage by mowers or string trimmers;
- keeping building and other maintenance activities away from the limbs and trunks of trees during repair projects;
- avoiding soil contamination from oil, gasoline, paint, paint thinner, or other chemicals; and,
- not attaching wires, cables, conduit, mailboxes or other objects to the trees.

PROTECT TREE

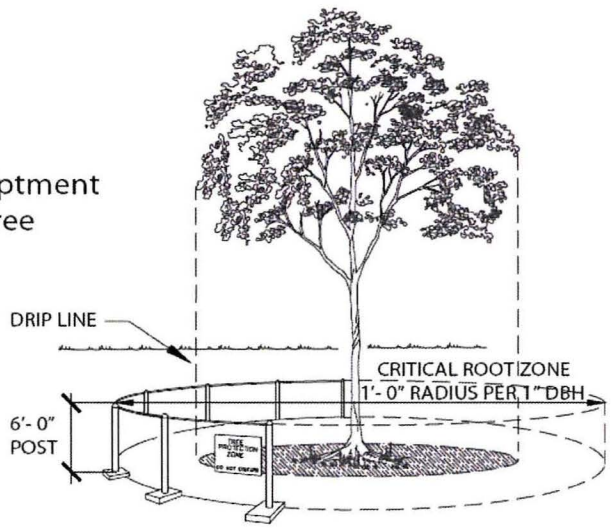
This tree is to be retained and protected from construction impacts

DO:

- Contact City of Tacoma Urban Forestry at (253) 591-2048 before commencement of work within the Tree Protection Zone
- Provide tree protection fencing at the edge of Tree Protection Zone
- Protect roots (retain existing pavement/mulch nonpaved surfaces)

DO NOT:

- Remove or prune tree
- Excavate, trench, operate equiptment or stack materials within the Tree Protection Zone

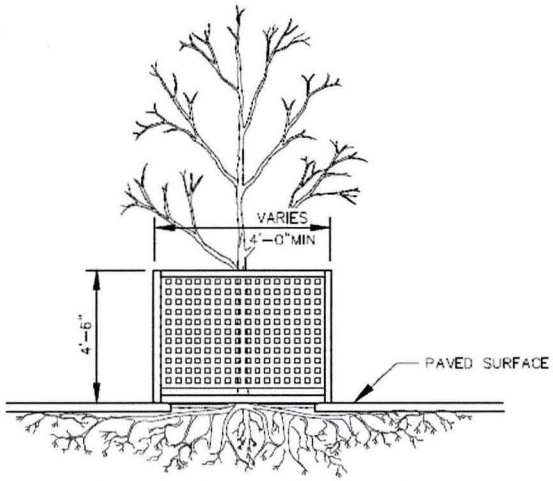


TREE PROTECTION ZONE IS AT THE EDGE OF THE CRITICAL ROOT ZONE OR DRIP LINE, WHICHEVER IS GREATER

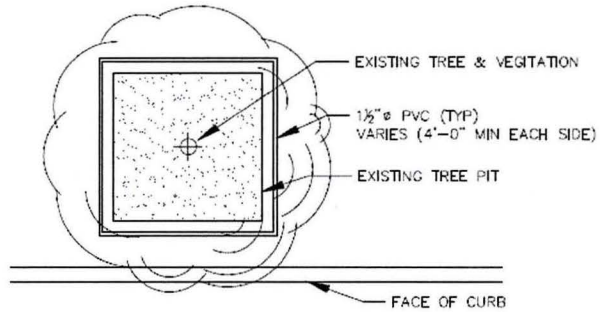
For more information about this project, please call _____ _____

Tacoma

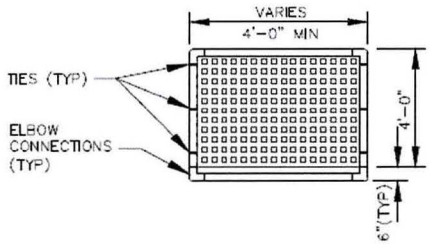
EverGreen Tacoma



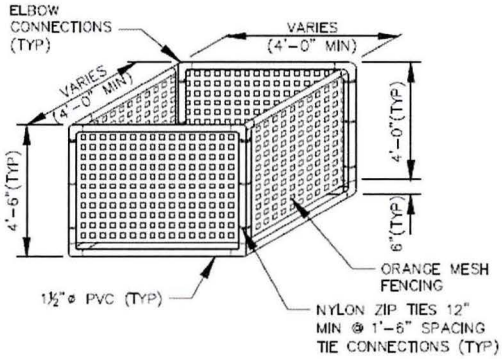
TYPICAL TREE GUARD RAIL



PLAN VIEW



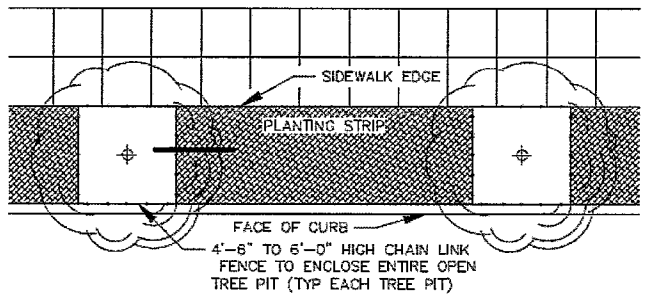
TYPICAL PANEL



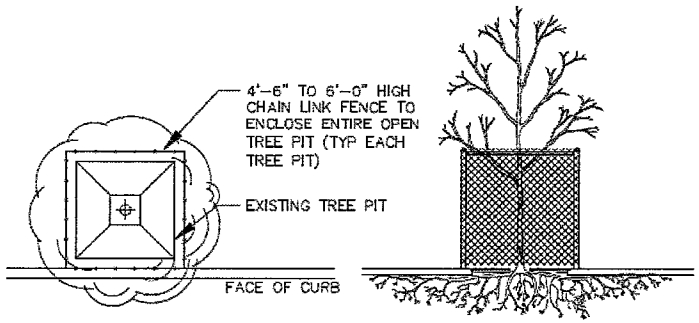
CITY OF TACOMA DEPARTMENT OF PUBLIC WORKS	APPROVED FOR PUBLICATION CITY ENGINEER DATE 00/00/00	REUSABLE TREE PROTECTION FENCING FOR ROW AND PARKING AREAS/LOTS STANDARD PLAN NO. L8.3

NOTES:

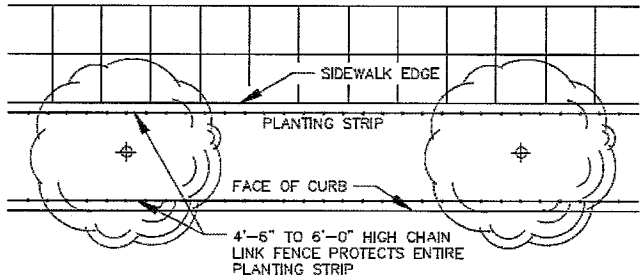
1. TREE PROTECTION REQUIREMENTS INCLUDED IN THIS STANDARD PLAN IS FOR TREES IN THE ROW AND PARKING LOTS/AREAS ONLY
2. REQUIRED PROTECTION MEASURES FOR TREES OTHER THAN THOSE IN TREE PITS AND PLANTING STRIPS ARE CONTAINED IN THE TYPICAL TREE PROTECTION FENCING STANDARD PLAN NO. L8.1
3. REUSABLE TEMPORARY TREE AND LANDSCAPE PROTECTION FENCING CAN BE SUBSTITUTED FOR CHAIN LINK FENCING IN TREE PITS AND PLANTING STRIPS (SEE REUSABLE TREE PROTECTION FENCING FOR ROW AND PARKING AREAS/LOTS STANDARD PLAN NO. L8.3)
4. CONSIDER TRAFFIC TURNING VISIBILITY AND PEDESTRIAN VISIBILITY WHEN SELECTING FENCE HEIGHT; TYPICALLY SHORTER FENCING AROUND TREE PITS BETWEEN SIDEWALK AND ROADWAY IS DESIRED.



TREE IN PLANTING STRIP—OPTION 1



TREE IN TREE PIT



TREE IN PLANTING STRIP—OPTION 2

TREE PROTECTION ZONE (TPZ)

THE TREE PROTECTION ZONE IS AN ARBORIST DEFINED AREA SURROUNDING THE TRUNK INTENDED TO PROTECT THE ROOTS AND SOIL TO ENSURE FUTURE TREE HEALTH AND SAFETY

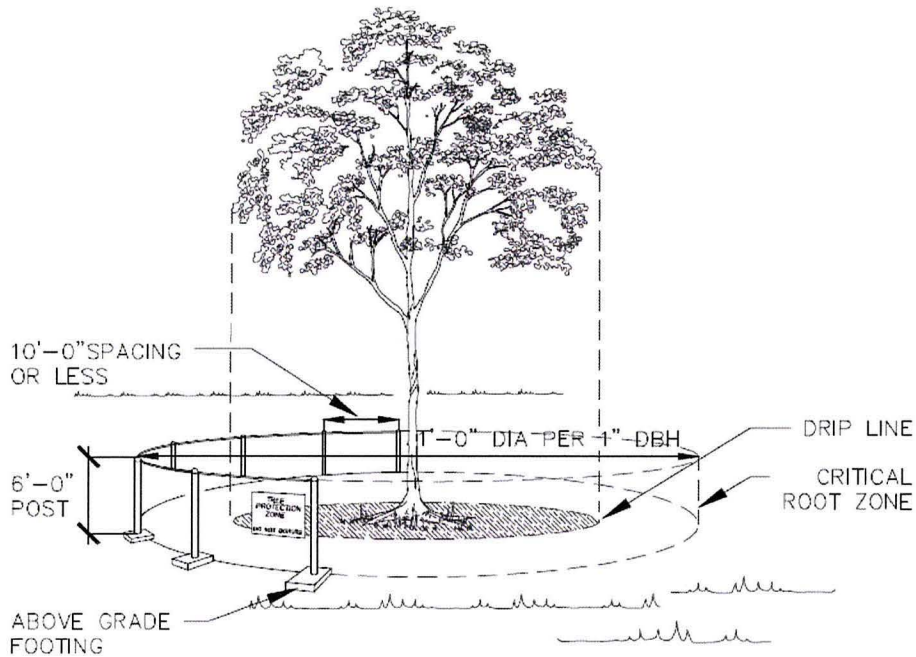
THE LOCATION OF THE TREE PROTECTION ZONE IS AT THE EDGE OF THE CRITICAL ROOT ZONE OR DRIP LINE, WHICHEVER IS GREATER; OR, OTHER AREA AS DEFINED BY THE PROJECTS ARBORIST OR URBAN FORESTER.

FOR CRITICAL ROOT ZONE AND DRIP LINE MEASUREMENTS SEE TREE PROTECTION DURING CONSTRUCTION STANDARD PLAN NO. L8.0

NOTES:

REQUIRED TREE PROTECTION MEASURES FOR TREES TO BE PROTECTED DURING CONSTRUCTION ARE AS FOLLOWS:

1. ERECT READILY VISIBLE SIX-FOOT (6'-0") HIGH CHAIN LINK FENCING AT THE EDGE OF THE TREE PROTECTION ZONE, AND AT THE BOUNDARY OF ANY OPEN SPACE TRACTS OR CONSERVATION EASEMENTS THAT ABUT THE CONSTRUCTION SITE EXCEPT WHERE, DUE TO SPACE RESTRICTIONS, A SPECIFIC DISTANCE IS SPECIFIED BY THE URBAN FORESTER
2. FENCING SHALL SECURED BY SIX-FOOT (6'-0") METAL POSTS WITH MOVABLE FOOTINGS LOCATED ABOVE GROUND. METAL POSTS SHALL NOT BE MORE THAN TEN FEET (10'-0") APART
3. FENCING SHALL BE FLUSH WITH THE INITIAL UNDISTURBED GRADE
4. SIGNS SHALL BE ATTACHED TO THE FENCING STATING THAT THE TREE IS DESIGNATED FOR PROTECTION AND THE AREA INSIDE THE FENCING IS A TPZ, WHICH IS NOT TO BE DISTURBED UNLESS PRIOR APPROVAL HAS BEEN OBTAINED FROM THE CITY AND/OR THE PROJECT'S ARBORIST
5. MAINTAIN THE FENCING IN PLACE UNTIL THE CITY AUTHORIZES REMOVAL OR A FINAL CERTIFICATE OF OCCUPANCY IS ISSUED, WHICHEVER OCCURS FIRST
6. ENSURE THAT ANY LANDSCAPING DONE IN THE TPZ, SUBSEQUENT TO THE REMOVAL OF THE FENCING, SHALL BE ACCOMPLISHED WITH LIGHT MACHINERY OR HAND LABOR
7. NO CONSTRUCTION ACTIVITY SHALL OCCUR WITHIN THE TPZ, INCLUDING BUT NOT LIMITED TO:
   - DUMPING OR STORAGE OF MATERIALS SUCH AS BUILDING SUPPLIES, SOIL, WASTE ITEMS, AND
   - STORAGE OF VEHICLES OR EQUIPMENT



TREE PROTECTION FENCING

CITY OF TACOMA DEPARTMENT OF PUBLIC WORKS	APPROVED FOR PUBLICATION CITY ENGINEER DATE 00/00/00	TREE PROTECTION FENCING STANDARD PLAN NO. L8.1

ZONE MEASUREMENTS

ZONE A (CRITICAL ROOT ZONE)

THE CRITICAL ROOT ZONE IS THE AREA UNDER A TREE WHOSE RADIUS MEASURES ONE FOOT PER ONE INCH OF DBH FROM THE TRUNK OUTWARDS AND TWENTY-FOUR INCHES (24") IN DEPTH
FOR EXAMPLE: FOR A TEN INCH DBH TREE, THE CRITICAL ROOT ZONE IS LOCATED AT LEAST TEN FEET (10'-0") OUT FROM THE TRUNK AND TWENTY-FOUR INCHES (24") DEEP

ZONE B (DRIP LINE)

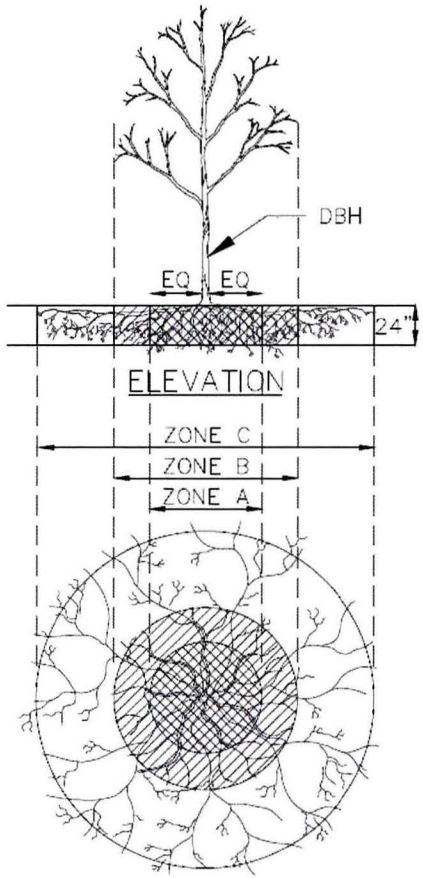
THE DRIP LINE IS THE AREA ON THE GROUND BELOW THE TREE IN WHICH THE BOUNDARY IS DESIGNATED BY THE EDGE OF THE TREE'S CROWN

ZONE C (FEEDER ROOT ZONE)

THE FEEDER ROOT ZONE IS THE AREA UNDER A TREE WHOSE RADIUS MEASURES TWO FEET PER ONE INCH OF DBH FROM THE TRUNK OUTWARDS AND TWENTY-FOUR INCHES (24") IN DEPTH
FOR EXAMPLE: FOR A TEN INCH DIAMETER TREE, THE CRITICAL ROOT ZONE IS LOCATED AT LEAST TWENTY FEET (20'-0") OUT FROM THE TRUNK AND TWENTY-FOUR INCHES (24") DEEP

TREE PROTECTION ZONE

THE TREE PROTECTION ZONE IS THE AREA SURROUNDING THE TRUNK OF A TREE INTENDED TO PROTECT THE ROOTS AND SOIL WITHIN THE CRITICAL ROOT ZONE AND BEYOND, TO ENSURE FUTURE TREE HEALTH AND STABILITY
THE LOCATION OF THE TREE PROTECTION ZONE IS AT THE EDGE OF THE CRITICAL ROOT ZONE (ZONE A) OR DRIP LINE (ZONE B), WHICHEVER IS GREATER



PLAN

FENCING/ROOT PROTECTION

FENCING IS TO BE INSTALLED AND MAINTAINED AT TREE PROTECTION ZONE, SEE TYPICAL TREE PROTECTION FENCING STANDARD PLANS NO. L8.1 AND L8.2

URBAN FORESTER'S APPROVAL REQUIRED FOR USE/ACCESS WITHIN ZONE B. PERMISSION FOR USE/ACCESS REQUIRES SURFACE PROTECTION* FOR ALL UNFENCED, UNPAVED SURFACES WITHIN ZONE B

BORING/TUNNELING/JACKING

1. BORING/TUNNELING/JACKING PERMITTED IN ALL ZONES, PROVIDING THAT ALL SOIL DISTURBANCE IS AT A DEPTH GREATER THAN 2'-0" BELOW GRADE
2. RECEIVING/INSERTION PIT NOT PERMITTED WITHIN ZONES A AND B
3. TUNNEL/BORE SHALL NOT EXCEED 6" IN DIA

TRENCHING/EXCAVATION

ZONE A (CRITICAL ROOT ZONE)

1. NO DISTURBANCE ALLOWED WITHOUT SITE-SPECIFIC INSPECTION AND APPROVAL OF METHODS TO MINIMIZE ROOT DAMAGE, EXCEPT IN THE CASE OF BORING/TUNNELING
2. IF ROOTS LARGER THAN 2" IN DIA. ARE ENCOUNTERED, APPROVAL FROM THE URBAN FORESTER IS REQUIRED BEFORE PROCEEDING TRENCHING/EXCAVATION WORK
3. TUNNELING IS REQUIRED TO INSTALL LINES 3'-0" BELOW GRADE OR DEEPER

ZONE B (DRIP LINE)

1. OPERATION OF HEAVY EQUIPMENT AND/OR STOCKPILING OF MATERIALS SUBJECT TO URBAN FORESTER'S APPROVAL
   * SURFACE PROTECTION MEASURES REQUIRED
2. TRENCHING PERMITTED AS FOLLOWS:
   -EXCAVATION BY HAND OR WITH A HAND-DRIVEN TRENCHER MAY BE REQUIRED
   -MINIMIZE TRENCH WIDTH TO THE EXTENT POSSIBLE
   -NO DISTURBANCE PERMITTED WITHIN ZONE A
   -MAINTAIN 2/3 OR MORE OF ZONE B IN AN UNDISTURBED CONDITION
3. TUNNELING MAY BE REQUIRED FOR TRENCHES DEEPER THAN 3'-0"

ZONE C (FEEDER ROOT ZONE)

1. OPERATION OF HEAVY EQUIPMENT AND/OR STOCKPILING OF MATERIALS SUBJECT TO URBAN FORESTER'S APPROVAL.
   * SURFACE PROTECTION MEASURES REQUIRED
2. TRENCHING ALLOWED AS FOLLOWS:
   -EXCAVATION BY HAND OR WITH HAND-DRIVEN TRENCHER MAY BE REQUIRED
   -MINIMIZE TRENCH WIDTH TO THE EXTENT POSSIBLE
   -MAINTAIN 2/3 OR MORE OF ZONE C IN AN UNDISTURBED CONDITION

*SURFACE PROTECTION MEASURES

1. WOOD CHIP MULCH LAYER, 6"-12" DEPTH; OR
2. 4" WOOD CHIP MULCH LAYER UNDER 3/4" PLYWOOD; OR
3. 4" GRAVEL OVER STAKED GEOTEXTILE FABRIC
4. 4" WOOD CHIP MULCH LAYER UNDER STEEL PLATES;
5. 4" WOOD CHIP MULCH LAYER UNDER LOGGING ROAD MATS

CITY OF TACOMA DEPARTMENT OF PUBLIC WORKS	APPROVED FOR PUBLICATION CITY ENGINEER DATE 00/00/00	TREE PROTECTION DURING CONSTRUCTION STANDARD PLAN NO. L8.0

NOTES:

1. TREE WELL DIMENSIONAL REQUIREMENTS:
A. SMALL TREES, WHOSE HEIGHT IS FIFTEEN (15) TO TWENTY-FIVE (25) FEET IN HEIGHT AT MATURITY, SHALL HAVE A MINIMUM UNPAVED PLANTING AREA OF TWENTY-FOUR (24) SQUARE FEET.
B. MEDIUM TREES, WHOSE HEIGHT IS TWENTY-SIX (26) TO FORTY (40) FEET IN HEIGHT AT MATURITY, SHALL HAVE A MINIMUM UNPAVED AREA OF THIRTY-TWO (32) SQUARE FEET.
C. LARGE TREES, WHOSE HEIGHT IS FOURTY-ONE (41) FEET AND GREATER AT MATURITY, SHALL HAVE A MINIMUM UNPAVED AREA OF FORTY (40) SQUARE FEET.

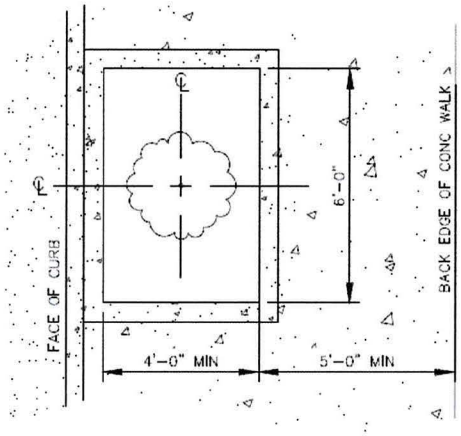
2. 2'-6" MINIMUM SPACING REQUIRED BETWEEN TREE CENTERLINE AND FACE OF CURB.

3. 2'-0" MINIMUM SPACING REQUIRED BETWEEN TREE CENTERLINE AND CONCRETE SIDEWALK.

4. THE ACCESSIBLE PORTION OF THE SIDEWALK MUST BE A MINIMUM OF 5'-0" AND BE FREE OF OBSTRUCTIONS.

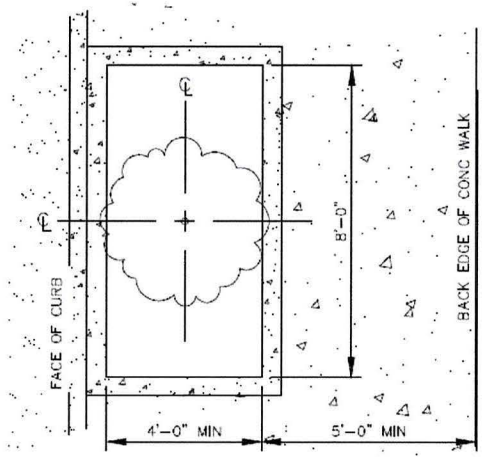
SMALL TREES

24 SQUARE FEET MIN
UNPAVED PLANTING AREA



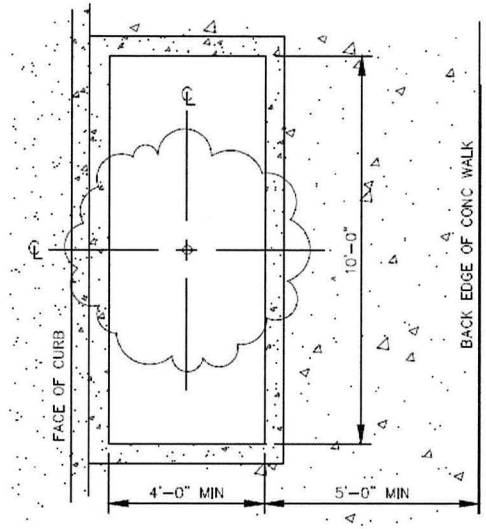
MEDIUM TREES

32 SQUARE FEET MIN
UNPAVED PLANTING AREA



LARGE TREES

40 SQUARE FEET MIN
UNPAVED PLANTING AREA



CITY OF TACOMA DEPARTMENT OF PUBLIC WORKS	APPROVED FOR PUBLICATION CITY ENGINEER DATE 00/00/00	TREE WELL DIMENSION DETAILS STANDARD PLAN NO. L5.0

CITY OF WOODINVILLE
TREE BOARD MEETING

PUBLIC COMMENT SIGN IN SHEET

DATE & TIME: Wednesday, August 28, 2013 5:30 PM

WELCOME to the Tree Board meeting! Public Comments provide an opportunity for the public to address the Tree Board on any subject which is not of a quasi-judicial nature. If you wish to speak, please indicate in the appropriate box when you sign in.

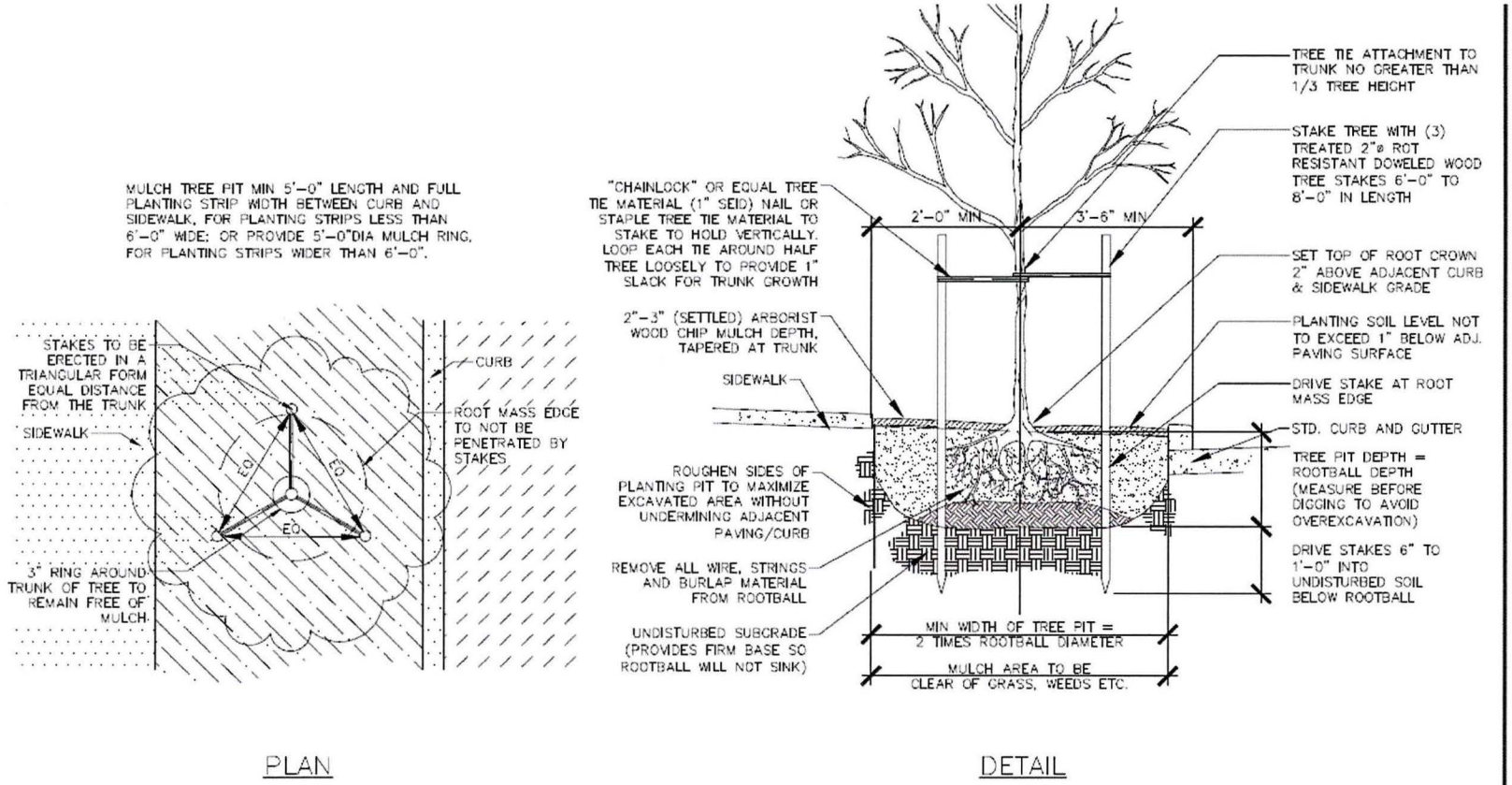
When you are recognized by Tree Board Chair:

1. Please stand before the podium and give your name and address.
2. Please limit your comments to three minutes per individual, and five minutes if representing a group until everyone has had a turn.
3. If previous speakers have made the same point, you may simply indicate your support or disagreement, unless you have new information.

Thank you for your participation.

PRINT NAME	ADDRESS/PHONE (Optional)	REPRESENTING SELF/BUSINESS	DO YOU WISH TO SPEAK?

PRINT NAME	ADDRESS/PHONE	REPRESENTING SELF/BUSINESS	DO YOU WISH TO SPEAK?



CITY OF TACOMA DEPARTMENT OF PUBLIC WORKS	APPROVED FOR PUBLICATION CITY ENGINEER DATE 00/00/00	TREE PLANTING DETAIL STANDARD PLAN NO. L1.0