5.2.4.1 Protect Historic or Specimen Trees

"The best time to plant a tree is twenty years ago. The second best time is now."

Description

Individual trees may be considered important resources because of unique or noteworthy characteristics or values such as size, age, species, historic significance, ecological value, aesthetics, location, trees planted as code requirements, or other characteristics or associations that make them special.

Tree well-being is often overlooked during construction and can result in fatal damage. A single, medium-sized U.S. city is estimated to lose $800,000 annually as a result of damage to trees during construction (Hauer et al. 1994). Damage is preventable and tree preservation is an important stormwater management measure, especially in dense urban areas.

BMP Functions Table

BMP	Applicability	Volume Reduction	Water Quality	Peak Rate Reduction	Recharge	Runoff Temperature Mitigation	Heat Island	Habitat Creation	Maintenance Burden	Cost
Protect Historic Trees	S/R	M	L	M	M	H	H	M	L	L

KEY: U = Urban; S = Suburban; R = Rural; H = High; M = Medium; L = Low

Key Design Guidelines

- Protect existing trees from disturbance.
- Prioritize protection and/or enhancement of large, mature trees based on location within the drainage area, quality of surrounding vegetation and soils, and cultural, historical, or aesthetic significance.
- Give special attention to protecting trees next to large areas of impervious surfaces.

Applications

- The BMP is applicable to any size of land development with existing, high-quality, mature trees or rare or culturally significant trees. These trees should be in good health.

Advantages

- Protecting and enhancing large mature trees will provide a head start for overall stormwater management of the site, as mature vegetation and high-quality soil take many years to establish.
- Protecting and enhancing quality of existing trees adds aesthetic value.
- Existing trees often require low maintenance.

Disadvantages

- Protecting and enhancing existing trees may conflict with development goals or construction activities.
- Existing specimen trees on a site may be minimal or be of low quality, making enhancement uneconomical or unfeasible.
- Preservation and enhancement require initial site investigation and protection activities during design and construction, which can add labor, time, and cost to the project.

Figure 5.2.4.1-1. Tree protection fence.

Figure 5.2.4.1-2. Tree protection fence with sign.

Design Considerations

<u>Tree Protection Zones</u>

Trees considered for protection from construction activity should be part of a larger site protection strategy. Construction areas containing trees to be preserved require additional restrictions on excavation and trenching. The tree protection zone includes both the structural and feeder roots, which can extend well beyond the drip line (canopy extent) of the tree. The outer portion of the tree protection zone represents the area where the feeder roots are concentrated. The majority of these roots lie within the top 18 inches of the soil and collect water and nutrients for the tree. The inner portion of the tree protection zone represents the area where structural (supporting) roots are concentrated. Both feeder and structural root zones are important to tree preservation and long-term health. Because the majority of a tree's roots lie close to the ground surface, construction activities should avoid the entire tree protection zone. Fencing and signage to protect these areas are required.

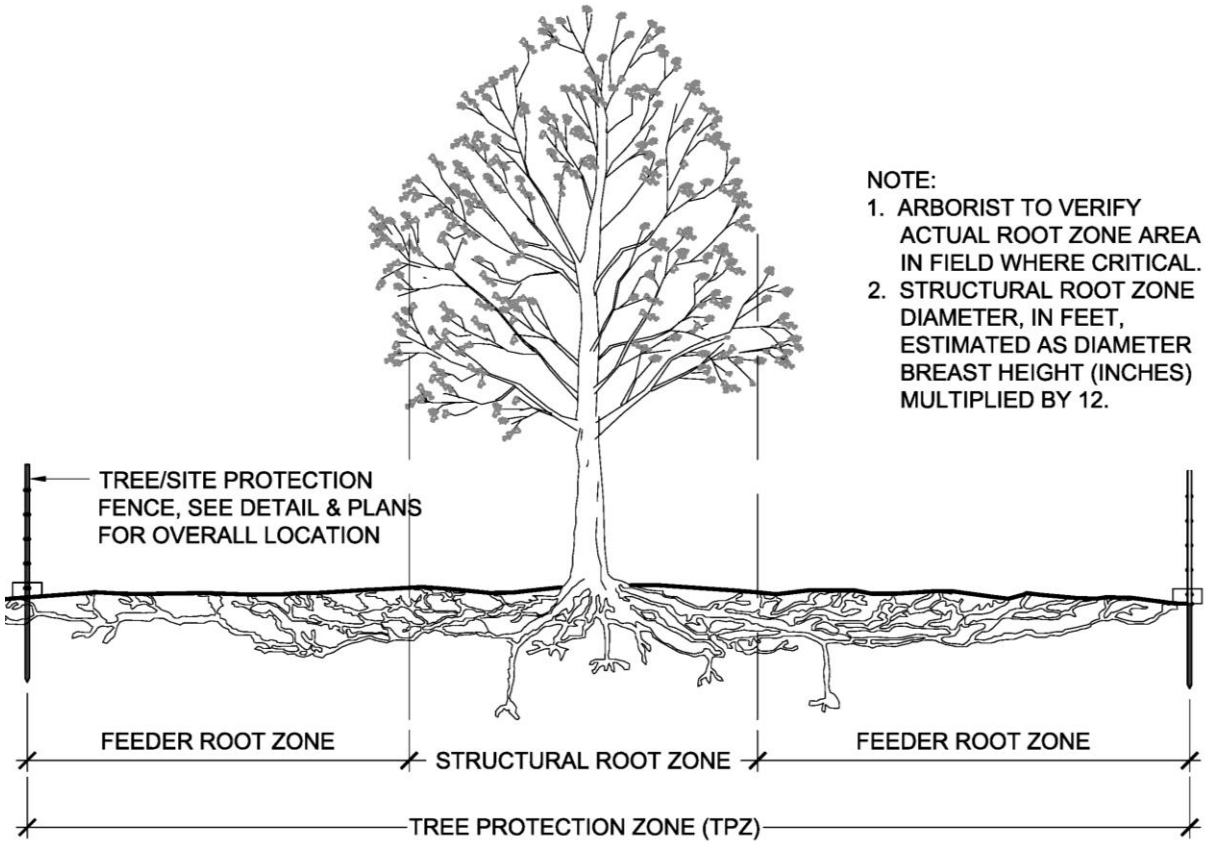

Figure 5.2.4.1-3. Tree protection zone detail.

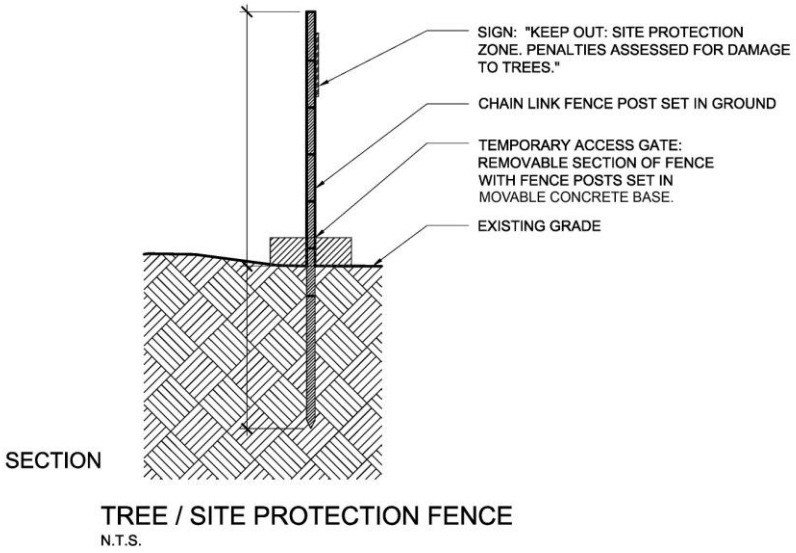

Figure 5.2.4.1-4. Tree protection zone fence detail.

When preserving trees within construction sites, it is important to define the tree protection zone as realistically as possible:

- With a large or specimen tree (native species 12 inches or greater, or as defined by the City Forester), air spading or carefully digging around the tree to investigate the true extent of the root zone is recommended.
- Alternatively, where possible, calculate the approximate tree protection zone using the Matheny and Clark method (1998). This methodology is based on tree size, age class, and the tolerance of the species to construction disturbance. See references.
- Where these methodologies are not feasible, use the drip line of the tree to approximate the root zones as a minimum.

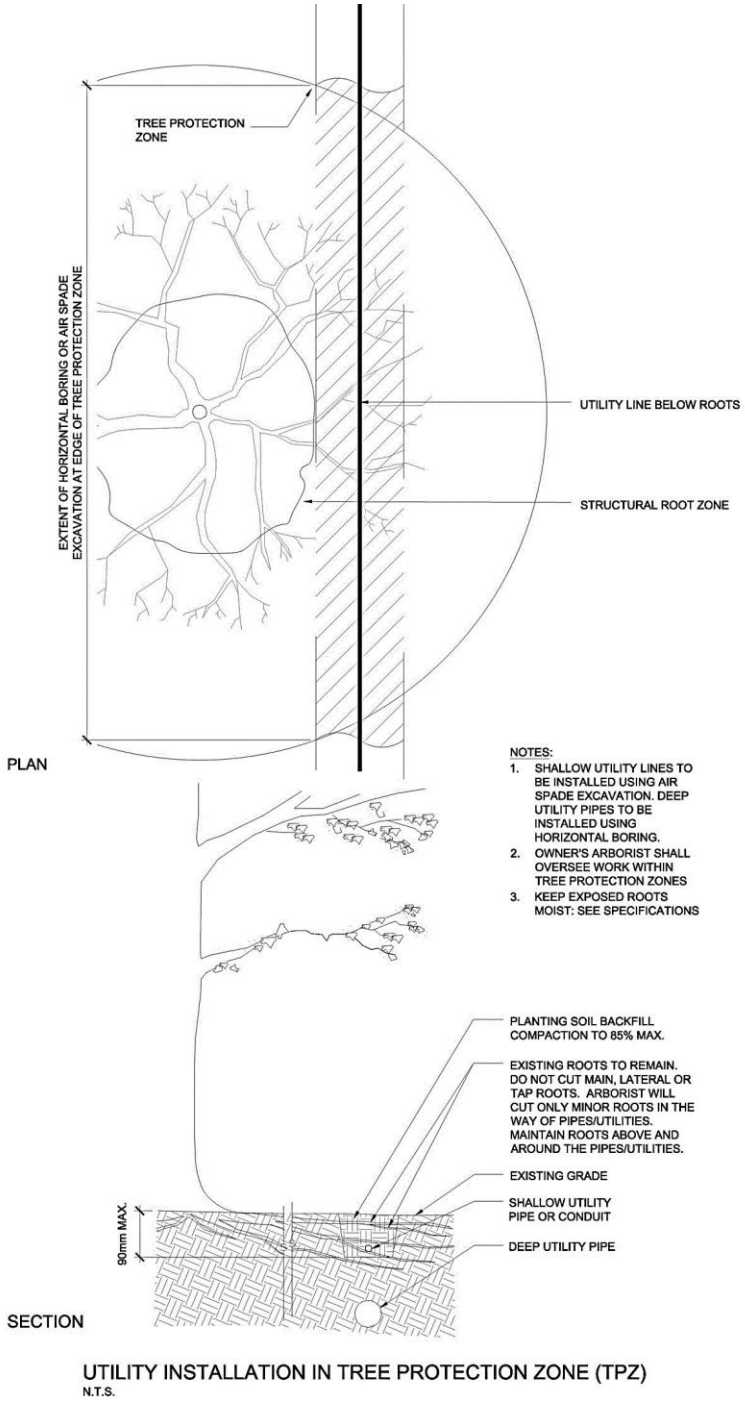

Figure 5.2.4.1-5. Utility installation detail.

Preconstruction Preparation

Trees that are "prepared" in advance for the stresses of nearby construction have a higher probability of surviving and thriving in the long term. Initial protection methods should be started one growing season before actual construction. Typical activities include:

- Treatments with plant growth regulators to promote root development and reduce drought stress.
- Advance root pruning where excavation is anticipated.
- Fertilization and other measures aimed at promoting overall tree health.
- Advance canopy pruning of existing trees located near areas of architectural construction and renovation to minimize canopy damage and allow vertical access to the façade.

Figure 5.2.4.1-6. Tree pruning.

Figure 5.2.4.1-7. Root pruning.

Irrigation

Irrigation should be considered only when absolutely necessary. It should be a temporary measure to solve specific problems, including:

- Trees extremely close to construction activities.
- Trees within proximity to deep excavation.
- Prolonged drought during the construction process.

Where irrigation is necessary within tree protection zones, the following must be considered in the design:

- Do not drastically alter the existing hydrological conditions of the area.
- Where possible, use harvested rainwater for irrigation.
- Spray from irrigation heads should not be directed to the aboveground parts of the trees; drip irrigation is preferred.
- Plot the least disruptive route for the irrigation lines located outside of the tree protection zones.
- Consider irrigation software that is capable of sensing the current climatic conditions or has a convenient manual override system to prevent unnecessary irrigation after rain. Examples include soil moisture sensors, digital rain gauges, and remote access irrigation software, which can be viewed and controlled from any computer with internet access.

Grade Beams, Piers, and Cantilevered Foundation Walls

Consider a specialized foundation design for small building additions and other site structures as an alternative to continuous footings near trees to be protected. Point footings, grade beams, and cantilevers require limited excavation, which will reduce the impact on root systems of adjacent trees.

Grading Design within Tree Protection Zones

Site and architectural design should preserve existing grades within tree protection zones to the extent possible to minimize damage to root systems. To minimize pavement impact, designs can be built slightly above existing grade to minimize excavation within the root zone. Where grade changes are unavoidable, slight increases in elevation (up to 12 inches of fill) are preferable, where the tree species can survive an increase in soil cover. Cut conditions, which sever roots, are not desirable. "Adventitious roots" originate from the tree trunk, branches, and leaves or old woody surface roots, rather than the underground root system. Trees with the ability to grow adventitious roots (e.g., ash, sycamores, certain maples, etc.) can survive large amounts of fill. Other species require tree wells or low retaining walls to maintain air circulation around the trunk to prevent rot.

Walkway Design within Tree Protection Zones

Walkways and other types of paving have the potential to cause damage to tree roots due to excavation and compaction for the sub-base construction. Impacts to adjacent trees can be reduced with the following measures:

- Where possible, avoid high-load-bearing (vehicular) pavements, which have thicker sub-bases, within tree protection zones.
- Where possible, use low-load-bearing (pedestrian) pavements.
- Design shallow pavement sections to minimize excavation.
- Design for finish grades slightly above existing grade to reduce excavation.
- Retain existing roots in the aggregate base course.
- Curved walkway alignments can skirt trunk flare and minimize future pavement upheaval.
- Consider flexible pavements with supporting geotextiles and minimal compaction.

Post-Construction Care

- Protection from "drought stress" post construction:
  - Proactive irrigation is beneficial during drought periods, since the recovering tree will have fewer reserves to combat subsequent stresses.
  - Irrigation needs to be carefully applied so as not to change the hydrology of the soil.
  - An effective treatment for water loss is the applications of paclobutrazol (PBZ), which retards plant growth. It is used as a foliar spray to reduce water loss from leaves (Rainbow Tree Care 2010).

- Soil chemistry remediation (fertilizing and other health boosts):
  Fertilizing, via top dressing with compost or compost teas, can benefit the tree and soil biota. For certain species, it may be beneficial to inoculate tree roots with mycorrhizae.

- Pruning:
  Dead wood and crossing branches should be pruned for tree health and safety.

Individual Trees – Relocation

Transplanting large trees may be called for in select cases. This is a very expensive protection measure and requires lead time, in advance of construction, to prepare the tree for relocation. Advance planning should be coordinated with an experienced contractor specializing in large tree moving. Considerations include:

- Proposed site characteristics: the slope, aspect, and soil conditions of the new site should match the original site as closely as possible.
- Preparation work includes root pruning, canopy pruning, chemical treatments, and other measures to improve tree health. This preparation is most effective if done throughout the growing season prior to the move, 9 to 14 months in advance.
- Moving large trees during the dormant season (approximately November to February) is most desirable. Transplanting at other times of the year is possible with sufficient care.
- A professional arborist with experience in large tree moving can provide an opinion of survivability and transplant feasibility for the specific species of the tree in question.
- Existing underground utilities may conflict with proposed root ball excavation. Sufficient overhead clearance should be confirmed along the moving route.
- Post-transplant care should be contracted for at least two years following the move. Care will need to include irrigation and monitoring.

Construction Considerations

Key tree protection measures during construction include:

- Restrict construction activity within tree protection zones, which includes no parking, vehicular use, stockpiling, storage, and staging within the designated root zone.
- Plan for temporary access for construction of specific, permanent features within the tree protection zone and protect with secondary fencing.
- Protect root zone from compaction:

Figure 5.2.4.1-8. Do not place heavy equipment in root zone.

- Access routes that cross through tree protection zones must include measures to protect the soil from compaction, contamination, and other disturbances.
- Limit potential access and design protection details.
- Avoid using large equipment where space is limited near existing trees to be retained.
- Route construction traffic where permanent sidewalks or roads are to be located, unless these routes will become BMPs with infiltration requirements. In other areas, use a matting system or other protective layers to buffer the soil from compaction (see Section 5.2.1, Protect Undisturbed and Healthy Soils, in this manual).

Figure 5.2.4.1-9. Do not stockpile in root zone.

References

Fazio, J. R. (ed). 2000. The way trees work – how to help. Tree City USA Bulletin No. 38. Nebraska City, NE: The National Arbor Day Foundation: 8.

Hauer, R.J., R.W. Miller, and D.M. Oulmet. 1994. Street Tree Decline and Construction Damage. *Journal of Arboriculture* 20(2), 94-97.

Matheny, N. and J.R. Clark. 1998. *Trees and development.* Chicago: International Society of Arboriculture.

Neely D. and G. Watson. (ed). 1998. The Landscape Below Ground II. Champaign: IL: International Society of Arboriculture: 265.

Rainbow Tree Care. 2010. *Tree growth and tree health: controlling growth to promote healthy trees in urban environments*. http://www.rainbowtreecare.com/planthealth/tree-growth.asp).

5.2.4.1 Protect Historic or Specimen Trees Criteria Checklist

ITEM DESCRIPTION	YES	N/A
The following checklist provides a summary of design guidance by the owner/applicant for successful implementation.		
• Protected trees are native species of at least 12 inches in diameter breast height or as defined by the City Forester.	☐	☐
• Trees are saved within proximity to proposed new impervious surfaces to provide canopy interception and exfiltration benefits.	☐	☐
• Delineate and label existing trees to be retained on Landscape and Stormwater Management Plan noting species and diameter breast height.	☐	☐
• Show tree protection zones with both structural and feeder root zones on plan(s).	☐	☐
• Provide detail or description of protective tree fencing.	☐	☐
• Provide written description of preconstruction preparations.	☐	☐
• Provide written description of any work that may need to be performed within the tree protection zone if necessary and methods to be used.	☐	☐
• Provide type and location of protected area signs. Signs should be in English and Spanish and should read “Stay Out” (“No Entrada”) or “Tree Save” (“Salve un Arbol”).	☐	☐
• Provide note on plans: *“Topping trees is not allowed. Trees removed or having their tops cut shall be replaced with the equivalent inches of removed trees.”*	☐	☐
• Provide note on plan: *“Thinning is allowed and may include manual removal of non-specimen trees within the tree protection zone of the specimen tree. (NO motorized/ wheeled or track vehicles allowed within tree protection zone of the specimen tree).”*	☐	☐
• Note on plans: *“Tree protection measures will be maintained at all times. Additional tree protection measures will be installed if deemed necessary by on-site inspection.”*	☐	☐