Tree Technical Manual

CITY OF PALO ALTO

Standards & Specifications
Palo Alto Municipal Code, Chapter 8.10.030

Photograph by Alvin Dockter

June, 2001 First Edition

Department of Planning and Community Environment

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Cover Photo
In 1997, Palo Altans celebrated their love for trees by enacting a tree preservation ordinance. This cover photo shows citizens enjoying the shade of a grand Valley Oak protected by ordinance and native to our region. Embracing the preservation of these trees demonstrates our investment in the future.
Photo by Alvin Dockter

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CITY OF PALO ALTO

TREE TECHNICAL MANUAL

STANDARDS AND SPECIFICATIONS

Palo Alto Municipal Code, Chapter 8.10.030

Prepared for the City Manager
by Dave Dockter, Managing Arborist

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"In Palo Alto, it's the trees!"

notes:

Intent & Purpose

The City of Palo Alto is endowed with a large population of trees, including magnificent individual trees, groupings of trees, native oaks, redwoods and heritage trees which give the City a unique visual character. Trees are a source of shade, air conditioning and other environmental benefits, and yield both a high quality of life and economic benefits to the community, including enhanced property values. The City is dedicated to the planting and protection of one of its greatest natural resources. Palo Alto is recognized by the State of California and National Arbor Day Foundation as a Tree City-USA.

Sustaining trees in Palo Alto's developed environment presents a challenge, requiring careful planning and vigilant maintenance. The vestiges of the City's original abundant oak and redwood environs, so well adapted to much of this region, are increasingly vulnerable after more than a century of development. Meeting this challenge, the Tree Preservation and Management Regulations were codified in 1997, adding Chapter 8.10 to Title 8 - Trees and Vegetation of the Palo Alto Municipal Code. The ordinance complements the City's Tree Management Program for street and parkland trees.

Tree Preservation and Management Regulations are the City's primary regulatory tool to provide for orderly protection of specified trees, to promote the health, safety, welfare, and quality of life for the residents of the City, to protect property values and to avoid significant negative impacts on adjacent properties. By assuring preservation and protection through regulations and standards of care, these resources will remain significant contributions to the landscape, streets and parks — and continue to help define the unique character of Palo Alto.

The *Tree Technical Manual* is a separately published document issued by the City Manager, through the Departments of Planning and Community Environment and Public Works to establish specific technical regulations, standards and specifications necessary to implement the Ordinance, and to achieve the City's tree preservation goals. These goals are intended to provide consistent care and serve as benchmark indicators to measure achievement in the following areas:

- Insure and promote preservation of the existing tree canopy cover within the City limits
- Provide standards of maintenance required for protected and city-owned trees
- Provide a standardized content for tree reports required by the City
- Establish criteria for determining when a tree is unsafe and a possible threat to the public health, safety and welfare
- Provide standards for the replacement of trees that are permitted to be removed
- Increase the survivability of trees during and after construction events by providing protection standards and best management practices

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notes:

Introduction – Use of the Manual

I. PALO ALTO'S REGULATED TREES

A. Palo Alto Municipal Code

Title 8 protects specific trees on public or private property from removal or disfigurement. The *Tree Technical Manual* establishes procedures and standards for the purpose of encouraging the preservation of trees. Trees that fall within the following three categories are considered *"Regulated Trees"*, and must be maintained in accordance with the standards and regulations contained in the *Manual*. A permit from the Planning or Public Works Department is required prior to removal of a *Regulated Tree*. Trees that are not in any of these categories may be maintained or removed without City review or approval.

▸ Protected Trees

PAMC 8.10

All Coast Live Oak, *Quercus agrifolia*, Valley Oak, *Quercus lobata* trees that are 11.5-inches or greater in diameter (36-inches in circumference measured at 54-inches above natural grade) and Coast Redwood, *Sequoia sempervirens* trees that are 18-inches or greater in diameter (57-inches in circumference measured at 54-inches above natural grade) and Heritage Trees, individual trees of any size or species designated as such by City Council. Property owners may nominate a tree that has distinctive characteristics such as being of great age or size, unique form or other historical significance. A list of designated heritage trees is kept at the Planning Division offices.

Oak Tree Identification
The Valley Oak leaf on the right has deeply-lobed margins. The Coast Live Oak leaf on the left is oval-shaped with stiff prickly points.

IMAGE 1-1

Redwood Tree Identification
The redwood tree leaf has needles on opposite sides of the stem with stiff prickly points. Small cones may also be present.

IMAGE 1-2

▸ Street Trees

PAMC 8.04.020

All trees growing within the street right-of-way (publicly-owned), outside of private property. In some cases, property lines lie several feet behind the sidewalks (*see Image 2.20-3*). A permit from the Public Works Department is required prior to any work on or within the dripline of any *'street tree'.*

notes:

- **Designated Trees**
  All trees, when associated with a development project, that are specifically designated by the City to be saved and protected on a public or private property which is subject to a *discretionary development* review; such as a variance, home improvement exception, architectural review, site and design, subdivision, etc. Approval from the Planning Division is required to remove a designated tree.

B. Protected Categories

Throughout the *Manual*, the designation of *Regulated Trees* shall refer to all those trees or groups of trees included in the above three categories.

II. REQUIRED PRACTICES

- The Required Practices are to be implemented by the property owner, project applicant, contractor or designee - and are the minimum standards by which the care of a *Regulated Tree* is to be administered.

- The Required Practices category identified throughout the *Manual* are reasonable measures that are consistent with best management practices in the tree care industry and are intended to promote healthy, structurally sound trees.

- In all such cases, the Director of Planning & Community Environment, Public Works or *City Arborist* shall, if justified by field conditions such as conflict with utilities or a public nuisance, have the discretion to modify or add to any condition, practice or standard mentioned within the *Manual*.

III. RECOMMENDED PRACTICES

- The Recommended Practices identified throughout the *Manual* are not mandatory, but provide additional proactive measures for the care of trees, such as fertilizing, reducing a tree hazard, protection from specific *disturbances* or procedures for planting trees on problem sites.

- Note: A *recommended practice* may be required if it is so specified within the 'conditions of approval' for a development project or mitigation for injury or disturbance.

- In all cases, the Director of Planning & Community Environment, Public Works or *City Arborist* shall, if justified by changing field conditions such as conflict with utilities, have discretion to modify, redesignate or add to any condition, practice or standard mentioned within the *Manual*.

IV. DEFINITIONS

Certain terms that are unique to the arboricultural or construction industry are defined to provide a uniform understanding of the terms and concepts used and mentioned in this document. Words that are defined are noted in *italics* throughout the document

and are found in the Definitions, Section 1.00 of both the *Manual*, and in the *Tree Preservation and Management Regulations*, Chapter 8.10.020 of the Palo Alto Municipal Code (*see Appendix A*).

notes:

V. APPENDICES

The appendices at the end of this *Manual* provide supplemental information referenced within the *Manual* and sources of technical information for specific or unusual situations.

VI. ASSUMPTIONS AND LIMITING CONDITIONS

- No responsibility is assumed by the City of Palo Alto for matters legal in character regarding this *Manual*. Any legal description that may be provided is assumed to be correct.
- Care has been taken to obtain reasonable information from reliable sources for this *Manual*.
- Visual aids within this *Manual*, such as sketches, diagrams, graphs, photos, are not necessarily to scale and should not be construed as engineered data for construction.
- This *Manual* has been crafted to conform with current standards of care, best management practices, evaluation and appraisal procedures, diagnostic and reporting techniques and sound arboricultural practices as recommended by the sources listed in the References section.

END OF SECTION

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SECTION 1.00 DEFINITIONS

For the purposes of this *Manual* and interpretation of regulations, the following definitions shall apply:

1. Appraisal (*see Tree Appraisal, Section 1.34*).
2. Building Area means the area of a parcel that (1) upon which, under applicable zoning regulations, a structure may be built without a variance, design enhancement exception, or home improvement exception or; (2) is necessary for the construction of primary access to structures located on the parcel, where there exists no feasible means of access which would avoid protected trees. On single-family residential parcels, the portion of the parcel deemed to be the building area access shall not exceed ten (10) feet in width.

   PAMC 8.10.020
3. Building Footprint means the two-dimensional configuration of a building's perimeter boundaries measured on a horizontal plane at grade level.

   PAMC 8.10.020
4. Certified Arborist is an individual who has demonstrated knowledge and competency through obtainment of the current International Society of Arboriculture arborist certification, or who is a member of the American Society of Consulting Arborists. A *certified arborist* can be found in the yellow pages of the local telephone book, by contacting Canopy: Trees for Palo Alto at (650) 964-6110 (www.canopy.org) or the Western Chapter of the ISA at (916) 641-2990 (www.wcisa.org).
5. City Arborist means the person designated as such by the Director of Planning and Community Environment or the Director of Public Works.
6. Compaction means compression of the soil structure or texture by any means that creates an upper layer that is impermeable ('cap'). *Compaction* is injurious to roots and the health of a tree (*see Soil Compaction Damage, Section 2.20*).
7. Dangerous see Hazardous.
8. Dead Tree means a tree that is dead or that has been damaged beyond repair or is in an advanced state of decline (where an insufficient amount of live tissue, green leaves, limbs or branches, exists to sustain life) and has been determined to be such by a *certified arborist*. If the tree has been determined to be dead, *removal* is permitted under Section 8.10.050 of the Palo Alto Municipal Code.
9. Designated Tree means all trees that are specifically designated by the City to be saved and protected on a public or private property which is subject to discretionary development approval (*see Discretionary Development Approval, Section 1.11*), such as a variance, home improvement exception, architectural review, site and design, subdivision, etc. Designated trees are to be indicated on approved building permit or landscape plans.

   PAMC 16.48.120

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10. Diameter at Breast Height (DBH) or Diameter at Standard Height means the diameter of the perimeter tree trunk at four and one-half feet (or 54 inches) above natural grade level. See '*Protected trees*' for diameters of different species. The diameter may be calculated by using the following formula: DBH= circumference at 4.5-feet x 3.142 (D=C x Þ). To determine the DBH of multi-trunk trees or measuring trees on slopes, consult the current *Guide for Plant Appraisal*, published by the Council of Tree and Landscape Appraisers.

11. Director means the Director of Planning and Community Environment or the Director's designee, unless otherwise specified in the *Manual*.

12. Discretionary Development Approval means a planned community zone, subdivision, use permit, variance, home improvement exception, design enhancement exception, or Architectural Review Board approval.

13. Disturbance refers to all of the various activities from construction or development that may damage trees.

14. Dripline Area means the area within X distance from the trunk of a tree, measured from the perimeter of the trunk of the tree at 54-inches above natural grade, where X equals a distance ten times the diameter of the trunk at 54-inches above natural grade.

15. Excessive Pruning means: removing in excess, one-fourth (25 percent) or greater, of the functioning leaf, stem or root area. Pruning in excess of 25 percent is injurious to the tree and is a prohibited act. *Excessive pruning* typically results in the tree appearing as a 'bonsai', 'lion's-tailed', 'lolly-popped' or overly thinned (*see 'Standards for Pruning Protected Trees*', *Section 5.15*).

    - Unbalanced Crown. *Excessive pruning* also includes removal of the leaf or stem area predominantly on one side, topping, or excessive tree canopy or crown raising. Exceptions are when clearance from overhead utilities or public improvements is required or to abate a *hazardous* condition or a *public nuisance*.
    - Roots. *Excessive pruning* may include the cutting of any root two (2) inches or greater in diameter and/or severing in excess of 25 percent of the roots.

16. Hazardous Tree refers to a tree that possesses a structural defect which poses an iminent risk if the tree or part of the tree that would fall on someone or something of value (target)(*see Determining if a tree is Hazardous, Section 4.00*).

    - Structural defect means any structural weakness or deformity of a tree or its parts. A tree with a structural defect can be verified to be *hazardous* by a *certified arborist* and confirmed as such by the City Arborist. For the purpose of tree removal information required by the City, the tree report shall include a completed *ISA-TREE HAZARD EVALUATION FORM*, or an approved equivalent. The *City Arborist* retains discretionary right to approve or amend a *hazardous* rating, in writing, and recommend any action that may reduce the condition to a less-than significant level of hazard. If the tree has been determined to be *hazardous*, *removal* of the tree is permitted under Section 8.10.050 of the Municipal Code.

- A *'target'* may mean people, vehicles, structures or property, such as other trees or landscape improvements. A tree may not be a hazard if a *'target'* is absent within the falling distance of the tree or it's parts (e.g., a substandard tree in a non-populated area away from pedestrian pathways may not be considered a hazard).

notes:

17. Injury means a wound resulting from any activity, including but not limited to *'excessive pruning'*, cutting, *trenching*, excavating, altering the grade, paving or *compaction* within the *tree protection zone* of a tree. *Injury* shall include bruising, scarring, tearing or breaking of roots, bark, trunk, branches or foliage, herbicide or poisoning, or any other action foreseeably leading to the death or permanent damage to tree health.

18. Monthly Inspection Report means a written report prepared by the property owner, *project arborist*, architect, developer, landscape architect, builder, applicant or other designated individual to document that a monthly tree inspection or any other required measure has been accomplished. The *project arborist* shall perform a site inspection to monitor the tree condition on a minimum interval of four weeks. The Planning Division Arborist shall be in receipt of the progress report during the first week of each calendar month until project completion at fax # (650) 329-2154.

19. Project Arborist means a *certified arborist* (*see Certified Arborist, Section 1.4*) retained by a property owner or development applicant for the purpose of overseeing on-site activity involving the welfare of the trees to be retained. The *project arborist* shall be responsible for all reports, *appraisals*, tree preservation plans, or inspections as required.

20. Protected Tree means:

    - All Coast Live Oak, *Quercus agrifolia*, Valley Oak, *Quercus lobata* that are 11.5-inches or greater in diameter (36-inches in circumference measured at 54-inches above natural grade) and Coast Redwood, *Sequoia sempervirens* trees that are 18-inches or greater in diameter (57-inches in circumference measured at 54-inches above natural grade) and Heritage trees, individual trees of any size or species designated by City Council having distinctive characteristics such as great age, large, unique form or possess historical significance (*see Introduction - Use of The Manual, Regulated Trees*).

21. Protective Tree Fencing means a temporary enclosure erected around a tree to be protected at the boundary of the *tree protection zone*. The fence serves three primary functions: 1) to keep the foliage crown, branch structure and trunk clear from direct contact and damage by equipment, materials or *disturbances*; 2) to preserve roots and soil in an intact and non-compacted state; and 3) to identify the tree protection zone (*see Section 2.15 E*) in which no soil *disturbance* is permitted and activities are restricted. (*For size, type, area and duration of the fencing, see Protective Tree Fencing, Section 2.15.D*).

22. Public Nuisance means either an individual tree or shrub on any private property or in any street, or a type or species apt to destroy, impair or otherwise interfere with any street improvements, sidewalks, curbs, *street trees*, gutters, sewers, or other public improvements, including above and below ground utilities.

PAMC 8.04.050 (b)

notes:

23. Recommended Practice means an action, treatment, technique or procedure that may be implemented for superior care or preservation of trees. Recommended practices may be required under specific conditions of approval for *discretionary development* projects or *injury* mitigation.

24. Regulated Tree means any *Protected Tree*, *Street Tree* or *Designated Tree*.

PAMC 8.10.020

25. Removal means any of the following:

    - Complete tree *removal* such as cutting to the ground or extraction of the tree.
    - Taking any action foreseeably leading to the death of a tree or permanent damage to its health or structural integrity, including but not limited to *excessive pruning*, cutting, girdling, poisoning, over watering, unauthorized relocation or transportation of a tree, or *trenching*, excavation, altering the grade, or paving within the *dripline* of the tree.

26. Required Practice means a mandatory action, treatment, technique or standard of care required to be implemented by the property owner, developer, contractor or designee for the preservation of trees

27. Root Buffer means a temporary layer of material to protect the soil texture and roots. The buffer shall consist of a base course of tree chips spread over the root area to a minimum of 6-inch depth, capped by a base course of 3/4-inch quarry gravel to stabilize 3/4-inch plywood on top. (*see Buffers, Section 2.15.5 B*).

28. Site Plan means a set of drawings (e.g. preliminary drawings, *site plan,* grading, demolition, building, utilities, landscape, irrigation, tree survey, etc.) that show existing site conditions and proposed landscape improvements, including trees to be removed, relocated or to be retained. *Site plans* shall include the following minimum information that may impact trees:

    - Surveyed tree location, species, size, *dripline area* (including trees located on neighboring property that overhang the project site) and *street trees* within 30-feet of the project site.
    - Paving, concrete, *trenching* or grade change located within the *tree protection zone*.
    - Existing and proposed utility pathways.
    - Surface and subsurface drainage and aeration systems to be used.
    - Walls, tree wells, retaining walls and grade change barriers, both temporary and permanent.
    - Landscaping, irrigation and lighting within dripline of trees, including all lines, valves, etc.
    - Location of other landscaping and significant features.
    - All of the final approved *site plan* sheets shall reference tree protection instructions (*see also Site Plan, Section 6.35*).

29. Soil Compaction means the compression of soil particles that may result from the movement of heavy machinery and trucks, storage of construction materials, structures, paving, etc. within the *tree protection zone*. Soil *compaction* can result in atrophy of roots and potential death of the tree, with symptoms often taking 3 to 10-years to manifest (*see Compaction, Section 2.20; and Aeration, Section 5.50 A*).

30. Soil Fracturing means the loosening of hard or compacted soil around a tree by means of a pneumatic soil probe (Gro-gun) that delivers sudden bursts of air to crack, loosen or expand the soil to improve the root growing environment.

31. Street Tree means any publicly owned tree, shrub or plant growing within the street right-of-way, outside of private property. In some cases, property lines lie several feet behind the sidewalks. A permit from the Public Works Department is required prior to any work on or around these trees. Check with the Public Works Department to verify prior to any work near a street tree (*see Introduction - Use of The Manual, Regulated Trees*).

32. Target is a term used to include people, vehicles, structures or something subject to damage by a tree.

    - Note: A tree may not be a hazard if a *"target"* is absent within the falling distance of a tree or its parts (e.g., a defective tree in a non-populated area away from pathways may not be considered a hazard (*see Hazardous Tree, Section 1.15*).

33. Topping means the practice of cutting back large-diameter branches or truncating the main stem.

34. Tree Appraisal means a method of determining the monetary value of a tree as it relates to the real estate value of the property, neighborhood or community. When required, a *certified arborist* determines the appraisal by adjusting a tree's basic value by its condition, location and species using the most recent edition of the *Guide for Plant Appraisal*, published by the Council of Tree and Landscape Appraisers (*see Tree Reports, Section 6.00*).

35. Tree Protection and Preservation Plan means a plan prepared by a *certified arborist* that outlines measures to protect and preserve trees on a project (*see Tree Protection and Preservation Plan, Section 2.10 and Reports, Section 6.30*). This plan shall include requirements for preconstruction; treatments during demolition and/or construction; establish a *tree protection zone* for each tree; tree monitoring and inspection schedule; and provide for continued maintenance of those trees after construction according to the requirements in this *Manual*.

36. Tree Protection Zone or (TPZ) means, unless otherwise specified by a *project arborist* or *City Arborist*, the area of temporary fenced tree enclosure (*see Protective Tree Fencing, Section 2.15.D, and Section 2.15.E*). Within the TPZ, roots that are critical for tree survival are typically found in the upper three foot soil horizon, and may extend beyond the *dripline area*. Protecting the roots in the TPZ is necessary to ensure the tree's survival. The TPZ is a restricted activity zone where no soil *disturbance* is permitted, unless otherwise approved. TPZ must be identified for each tree and shown on all applicable improvement plans for a development project. Restricted and approved activities within the TPZ are outlined in Section 2.15.E.

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PAMC 8.04.020

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- Determining the TPZ. Unless otherwise specified, the approved minimum TPZ shall be formulated in the following way: the TPZ radius shall be 10 times the DBH of the trunk (*see Dripline area, Section 1.13*). For example: a 2-foot DBH = a 20-foot radius from the perimeter of the trunk—or a 40-foot TPZ. The *City Arborist* retains discretionary right to extend or modify the TPZ at any time.

37. Tree Report means a report submitted to the City for review that is prepared by a *certified arborist* retained by the property owner or agent.

    - Tree Survey Report. In the case of a *discretionary development approval*, a tree survey report is required to provide information about all trees on the site including: inventory of all trees, location, species, size, condition, maintenance needs, potential impacts of disturbance, recommended mitigation measures, tree appraisal value, etc. (*see Tree Reports; Tree Protection and Preservation Plan and Tree Appraisal, Section 6.00*).

    - Letter Report. A 'letter report' shall provide a brief description of the tree information to determine whether or not a tree is dead, hazardous or constitutes a public nuisance as defined in Palo Alto Municipal Code, Chapter 8.04.050 (2) (*see Tree Reports; Tree Protection and Preservation Plan and Tree Appraisal, Section 6.00*).

PAMC 8.10.030

38. Tree Technical Manual is this document.

39. Trenching means any excavation to provide irrigation, install foundations, utility lines, services, pipe, drainage or other property improvements below grade. *Trenching* within the TPZ is injurious to roots and tree health and is prohibited, unless approved. If *trenching* is approved within the TPZ, it must be in accordance with instructions and table outlined in this *Manual* (*see Trenching, Section 2.20.C, and Existing Paving and Hardscape Conflicts with Tree Roots, Section 2.40*).

40. Verification of Tree Protection means the *project arborist* shall verify, in writing, that all pre-construction conditions have been met (tree fencing, erosion control, pruning, etc.) and are in place. An initial inspection of protective fencing and written verification must be submitted to the *City Arborist* prior to demolition, grading or building permit issuance (*see Inspections, Section 2.30*).

41. Vertical Mulching means augering, hydraulic or air excavation of vertical holes within a tree's root zone to loosen and aerate the soil, typically to mitigate compacted soil. Holes are typically penetrated 4- to 6-feet on center, 2- to 3-feet deep, 2- to 6-inches in diameter and backfilled with either perlite, vermiculite, peat moss or a mixture thereof.

END OF SECTION

notes:

SECTION 2.00 - PROTECTION OF TREES DURING CONSTRUCTION

INTRODUCTION
The objective of this section is to reduce the negative impacts of construction on trees to a less than significant level. Trees vary in their ability to adapt to altered growing conditions. Mature trees have established stable biological systems in the preexisting physical environment. Disruption of this environment by construction activities interrupts the tree's physiological processes causing depletion of energy reserves and a decline in vigor, often resulting in the tree's death. Typically, this reaction may develop from one to twelve years or more after disruption. The tree protection regulations are intended to guide a construction project to insure that appropriate practices will be implemented in the field to eliminate undesirable consequences that may result from uninformed or careless acts, and preserve both trees and property values.

Typical negative impacts that may occur during construction include:

- mechanical *injury* to roots, trunk or branches
- *compaction* of soil, which degrades the functioning roots and inhibits the development of new ones and restricts drainage, which desiccates roots and enables water mold fungi to develop
- changes in existing grade which can cut or suffocate roots
- alteration of the water table - either raising or lowering
- microclimate change, exposing sheltered trees to sun or wind
- sterile soil conditions, associated with stripping off topsoil.

Construction projects within the *tree protection zone* (TPZ) of *Regulated Trees* are required to implement the protective practices described in Section 2.00.

2.10 TREE PROTECTION AND PRESERVATION PLAN

Required Practices

Prior to commencement of a development project, a property owner shall have prepared a *Tree Protection and Preservation Plan* if any activity is within the dripline of a *Protected* or *Designated Tree*, (*see Tree Reports, Section 6.30 and Section 1.35*). The Tree Protection Plan will be prepared by a *certified arborist* to assess impacts to trees; recommend mitigation to reduce impacts to a less than significant level and identify construction guidelines to be followed through all phases of a construction project. Projects protecting only *street trees* with fencing (*see Protective Tree Fencing, Section 2.15.D*) are exempt from preparing a Tree Protection and Preservation Plan.

notes:

Required Practices

2.15 PRE-CONSTRUCTION REQUIREMENTS

The following six steps shall be incorporated within the Tree Protection and Preservation Plan prior to building permit issuance.

A. Site Plan

On all improvement plans for the project, plot accurate trunk locations and the *'dripline areas'* of all trees or groups of trees to be preserved within the development area. (*see Site Plan, Section 1.00*). In addition, for *Protected* and *Street Trees* (oaks, redwoods, heritage or *street trees*) the plans shall accurately show the trunk diameter, dripline and clearly indicate the *tree protection zone* to be enclosed with the specified tree fencing as a bold dashed line.

B. Verification of tree protection

The *project arborist* or contractor shall verify, in writing, that all preconstruction conditions have been met (tree fencing, erosion control, pruning, etc.) and is in place. Written verification must be submitted to and approved by the Planning Department prior to demolition, grading or building permit issuance (*see Inspections, Section 2.30*).

C. Pre-construction meeting

The demolition, grading and underground contractors, construction superintendent and other pertinent personnel are required to meet with the *Project Arborist* at the site prior to beginning work to review procedures, tree protection measures and to establish haul routes, staging areas, contacts, watering, etc.

D. Protective Tree Fencing for Protected Trees, Street Trees or Designated Trees

Fenced enclosures shall be erected around trees to be protected to achieve three primary goals, (1) to keep the foliage crowns and branching structure clear from contact by equipment, materials and activities; (2) to preserve roots and soil conditions in an intact and non-compacted state and; (3) to identify the *tree protection zone* (TPZ) in which no soil *disturbance* is permitted and activities are restricted, unless otherwise approved (*see Tree Protection Zone, Section 1.00 and 2.15.E*).

- Size and type of fence
  All trees to be preserved shall be protected with five or six (5' - 6') foot high chain link fences. Fences are to be mounted on two inch diameter galvanized iron posts, driven into the ground to a depth of at least 2-feet at no more than 10-foot spacing (*see Public Works Department Detail #505, Appendix K*). This detail shall appear on grading, demolition and improvement plans.
- Area to be fenced.

notes:

IMAGE 2.15-1
Tree Protection Fence at the Dripline

IMAGE 2.15-2
Tree Protection Fence at the Dripline

• Type I Tree Protection
The fences shall enclose the entire area under the **canopy dripline or TPZ** of the tree(s) to be saved throughout the life of the project, or until final improvement work within the area is required, typically near the end of the project (*see Images 2.15-1 and 2.15-2*). Parking Areas: If the fencing must be located on paving or sidewalk that will not be demolished, the posts may be supported by an appropriate grade level concrete base.

IMAGE 2.15-3
Tree Protection within a Planter Strip

• Type II Tree Protection
For trees situated within a **narrow planting strip**, only the planting strip shall be enclosed with the required chain link protective fencing in order to keep the sidewalk and street open for public use.(*see Image 2.15-3*)

IMAGE 2.15-4
Trunk Wrap Protection

• Type III Tree Protection
Trees situated in a small tree well or **sidewalk planter pit**, shall be wrapped with 2-inches of orange plastic fencing as padding from the ground to the first branch with 2-inch thick wooden slats bound securely on the outside. During installation of the wood slats, caution shall be used to avoid damaging any bark or branches. Major scaffold limbs may also require plastic fencing as directed by the *City Arborist*. (*see Image 2.15-4*)

notes:

- Duration
  Tree fencing shall be erected before demolition, grading or construction begins and remain in place until final inspection of the project permit, except for work specifically required in the approved plans in which case the *project arborist* or *City Arborist* (in the case of *streettrees*) must be consulted.

- 'Warning' Sign
  A warning sign shall be prominently displayed on each fence. The sign shall be a minimum of 8.5 x 11-inches and clearly state: WARNING - *Tree Protection Zone* - This fence shall not be removed and is subject to a penalty according to PAMC Section 8.10.110.9. (*see Image 2.15-5*).

IMAGE 2.15-5
'Warning' Sign

Required Practices

E. Tree Protection Zone or (TPZ)

Each tree to be retained shall have a designated TPZ identifying the area sufficiently large enough to protect the tree and roots from *disturbance*. The recommended TPZ area can be determined by the formula outlined (*see Definitions, Tree Protection Zone, Section 1.36*). The TPZ shall be shown on all site plans (*see Definitions, Site Plan, Section 1.28*) for the project. Improvements or activities such as paving, utility and irrigation *trenching* and other ancillary activities shall occur outside the TPZ, unless authorized by the *City Arborist*, or by project approval. Unless otherwise specified, the protective fencing shall serve as the TPZ.

1. Activities prohibited within the TPZ include:

   - Storage or parking vehicles, building materials, refuse, excavated spoils or dumping of poisonous materials on or around trees and roots. Poisonous materials include, but are not limited to, paint, petroleum products, concrete or stucco mix, dirty water or any other material which may be deleterious to tree health.
   - The use of tree trunks as a winch support, anchorage, as a temporary power pole, sign posts or other similar function.
   - Cutting of tree roots by utility *trenching*, foundation digging, placement of curbs and trenches and other miscellaneous excavation without prior approval of the *City Arborist.*
   - Soil *disturbance* or grade change (*see Grade Changes and Trenching, Section 2.20*).
   - Drainage changes.

2. Activities permitted or required within the TPZ include:

   - Mulching. During construction, wood chips may be spread within the TPZ to a 4-to 6-inch depth, leaving the trunk clear of mulch to help inadvertent *compaction* and moisture loss from occurring. The mulch may be removed if improvements or other landscaping is required. Mulch material shall be 2-inch unpainted, untreated wood chip mulch or approved equal.
   - *Root Buffer*. When areas under the tree canopy cannot be fenced, a temporary buffer is required and shall cover the root zone and remain in place at the specified thickness until final grading stage (*see Definitions, Section 1.27, and Heavy Equipment,Section 2.20 C*).
   - Irrigation, aeration, fertilizing or other beneficial practices that have been specifically approved for use within the TPZ.

3. Erosion Control. If a tree is adjacent to or in the immediate proximity to a grade slope of 8% (23 degrees) or more, then approved erosion control or silt barriers shall be installed outside the TPZ to prevent siltation and/or erosion within the TPZ.

notes:

F. Tree Pruning, Surgery and Removal

Required Practices

Prior to construction, various trees may require that branches be pruned clear from structures, activities, building encroachment or may need to be strengthened by means of mechanical support or surgery. The most compelling reason to prune is to develop a strong, safe framework and tree structure. Such pruning, surgery or the *removal* of trees shall adhere to the following standards:

1. Pruning limitations:

   - Minimum Pruning: If the *project arborist* recommends that trees be pruned, and the type of pruning is left unspecified, the standard pruning shall consist of 'crown cleaning' as defined by ISA Pruning Guidelines (*see Pruning, Section 5.15, and Appendix E*). Trees shall be pruned to reduce hazards and develop a strong, safe framework.
   - Maximum Pruning: Maximum pruning should only occur in the rarest situation approved by the *City Arborist*. No more than one-fourth (25 percent) of the functioning leaf and stem area may be removed within one calender year of any *protected* or *designated tree*, or *removal* of foliage so as to cause the unbalancing of the tree. It must be recognized that trees are individual in form and structure, and that pruning needs may not always fit strict rules. The *project arborist* shall assume all responsibility for special pruning practices that vary from the standards outlined in this *manual* (*see Excessive Pruning, Section 1.15*).
   - Tree Workers. Pruning shall not be attempted by construction or contractor personnel, but shall be performed by a qualified tree care specialist or certified tree worker, according to specifications contained within this *Manual* (*see Pruning Mature Trees, Section 5.20*).

notes:

2. Surgery. Prior to construction, if it is necessary to promote health and prolong useful life or the structural characteristics, then trees shall be provided the appropriate treatments (e.g. cavity screening, bark tracing, wound treatment, cables, rods or pole supports) as specified by the *project arborist* (*see ANSI A-300, Appendix G*).

3. Tree *Removal* Procedure. When *Regulated Trees* are removed and adjacent trees that are to be preserved (as shown on the approved *site plans*) must be protected, then the following tree *removal* practices apply:

   - Tree Removal
     Removal of trees that extend into the branches or roots of *Regulated Trees* shall not be attempted by demolition or construction personnel, grading or other heavy equipment. A *certified arborist* or tree worker shall remove the tree carefully in a manner that causes no damage above or below ground to trees that remain.

   - Stump Removal
     Before performing stump extraction, the developer shall first consider whether or not roots may be entangled with trees that are to remain. If so, these stumps shall have their roots severed before extracting the stump. *Removal* shall include the grinding of stump and roots to a minimum depth of 24-inches but expose soil beneath stump to provide drainage. In sidewalk or small planter areas to be replanted with a new tree, the entire stump shall be removed and the planting pit dug to a depth of 30-inches. If dug below 30-inches, compact the backfill to prevent settling. Large surface roots three feet from the outside circumference shall be removed, including the spoils and backfilled with City approved topsoil to grade, and the area tamped to settle the soil.

Required Practices

2.20 ACTIVITIES DURING CONSTRUCTION & DEMOLITION NEAR TREES

Soil *disturbance* or other injurious and detrimental activity within the *Tree Protection Zone* (TPZ) is prohibited unless approved by the City based on a *tree report*. If an injurious event inadvertently occurs, or soil *disturbance* has been specifically conditioned for project approval, then the following mitigation is required:

A. Soil Compaction

If *compaction* of the soil occurs, it shall be mitigated as outlined in Soil Compaction Damage, Section 2.20, E and/or Soil Improvement, Section 5.50.

B. Grading Limitations within the Tree Protection Zone

- Grade changes outside of the TPZ shall not significantly alter drainage to the tree.
- Grade changes within the TPZ are not permitted.
- Grade changes under specifically approved circumstances shall not allow more than 6-inches of fill soil added or allow more than 4-inches of existing soil to be removed from natural grade unless mitigated.

- Grade fills over 6-inches or impervious overlay shall incorporate an approved permanent aeration system, permeable material or other approved mitigation.
- Grade cuts exceeding 4-inches shall incorporate retaining walls or an appropriate transition equivalent.

notes:

C. Trenching, Excavation and Equipment Use

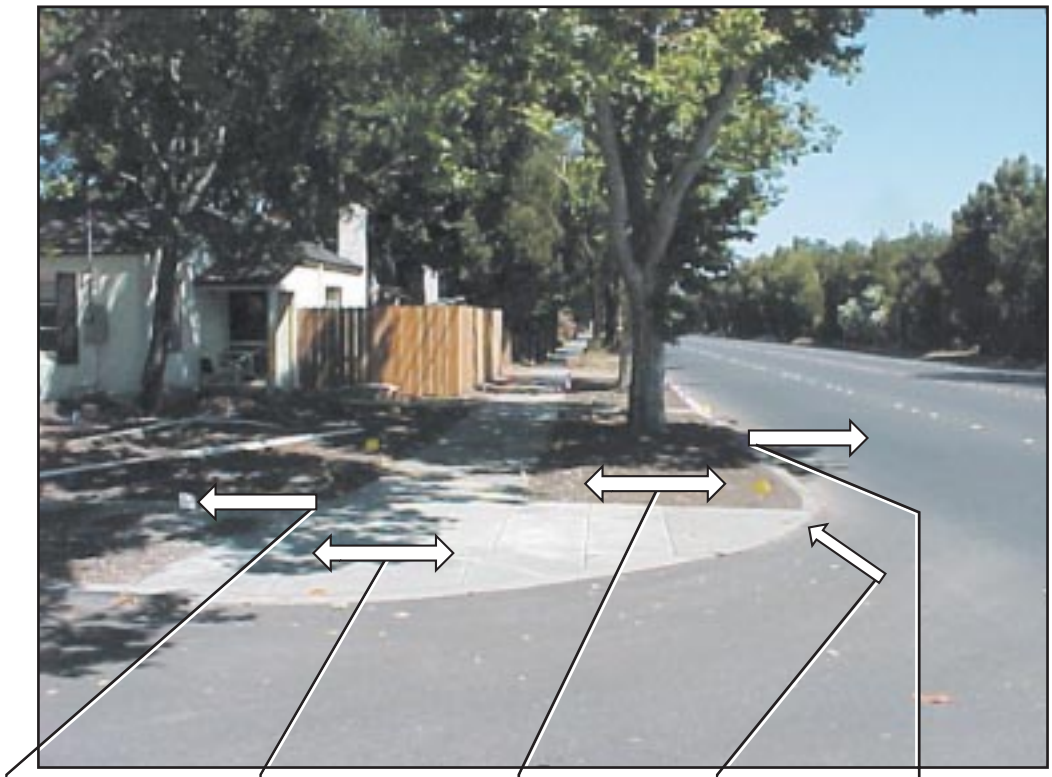
Required Practices

Trenching, excavation or boring activity within the TPZ is restricted to the following activities, conditions and requirements if approved by the *City Arborist*. *(See Restriction Zones for Excavation, Trenching or Boring Near Regulated Trees, Image 2.20-1 through 2.20-3)*. Mitigating measures shall include prior notification to and direct supervision by the *project arborist*.

1. Notification. Contractor shall notify the *project arborist* a minimum of 24 hours in advance of the activity in the TPZ.
2. Root Severance. Roots that are encountered shall be cut to sound wood and repaired (*see Root Injury, Section 2.25 A-1*). Roots 2-inches and greater must remain injury free.
3. Excavation. Any approved excavation, demolition or extraction of material shall be performed with equipment sitting outside the TPZ. Methods permitted are by hand digging, hydraulic or pneumatic air excavation technology. Avoid excavation within the TPZ during hot, dry weather.
    - If excavation or *trenching* for drainage, utilities, irrigation lines, etc., it is the duty of the contractor to tunnel under any roots 2-inches in diameter and greater.
    - Prior to excavation for foundation/footings/walls, grading or *trenching* within the TPZ, roots shall first be severed cleanly 1-foot outside the TPZ and to the depth of the future excavation. The trench must then be hand dug and roots pruned with a saw, sawzall, narrow trencher with sharp blades or other approved root pruning equipment.
4. Heavy Equipment. Use of backhoes, steel tread tractors or any heavy vehicles within the TPZ is prohibited unless approved by the *City Arborist*. If allowed, a protective *root buffer* (*see Root Buffer and Damage to Trees, Section 2.25.A-1*) is required. The protective buffer shall consist of a base course of tree chips spread over the root area to a minimum of 6-inch depth, layered by 3/4-inch quarry gravel to stabilize 3/4-inch plywood on top. This buffer within the TPZ shall be maintained throughout the entire construction process.
    - Structural design. If injurious activity or interference with roots greater than 2-inches will occur within the TPZ, plans shall specify a design of special foundation, footing, walls, concrete slab or pavement designs subject to *City Arborist* approval. Discontinuous foundations such as concrete pier and structural grade beam must maintain natural grade (not to exceed a 4-inch cut), to minimize root loss and allow the tree to use the existing soil.

notes:

IMAGE 2.20-1
Restriction Zones For Excavation, Trenching Or Boring
Within A Tree Dripline In A Planter Strip



Zone 1 Private Property	**Zone 2** Sidewalk	**Zone 3** Planter Strip	**Zone 4** Curb & Gutter	**Zone 5** Roadway
Severing roots greater than 1" needs approval by property owner arborist.	Severing roots greater than 2" needs approval by Public Works Arborist.	No mechanical digging. Severing roots greater than 2" needs approval by Public Works Arborist.	Severing roots greater than 2" needs approval by Public Works Arborist.	No Restrictions

notes:

IMAGE 2.20-2
Restriction Zones For Excavation, Trenching Or Boring within A Tree Dripline And No Curb Or Sidewalk

Zone 1
Private Property

Severing roots greater than 1" needs approval by property owner arborist.

Zone 3
Tree Protection Zone to Pavement Edge

No mechanical digging. Severing roots greater than 2" needs approval by Public Works Arborist.

Zone 4
Pavement Edge

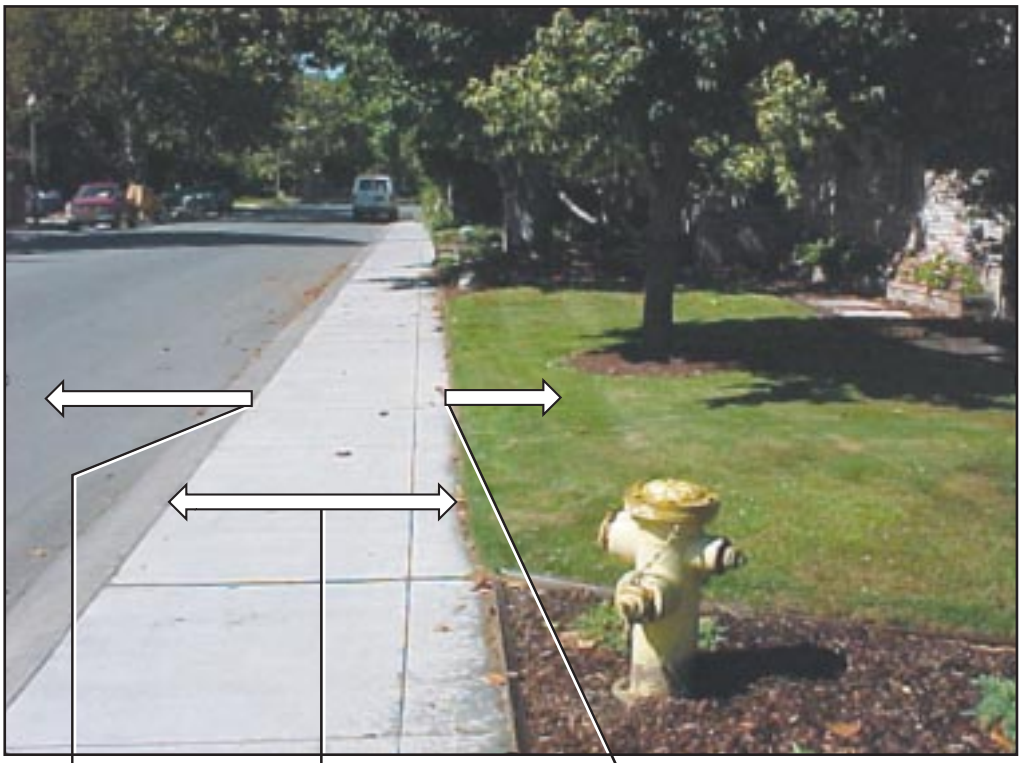
Severing roots greater than 2" needs approval by Public Works Arborist.

Zone 5
Roadway

No Restrictions

notes:

IMAGE 2.20-3
Restriction Zones for Excavation, Trenching or Boring within a Tree Dripline behind Sidewalk and Rolled Curb



Zone 5
Roadway
No Restrictions

Zone 2
Sidewalk
Severing roots greater than 2" needs approval by Public Works Arborist.

Zone 1
City Owned Tree
City owned tree is usually within 5' back of sidewalk. Severing roots greater than 1" needs approval by Public Works Arborist.

- Basement excavations shall be designed outside the TPZ of all *protected* and *designated trees* (*see Excavation, Section 2.20-3*) and shall not be harmful to other mature or neighboring property trees.

notes:

Required Practices

D. Tunneling & Directional Drilling

If *trenching* or pipe installation has been approved within the TPZ, then the trench shall be either cut by hand, air-spade, hydraulic vac-on excavation or, by mechanically boring the tunnel under the roots with a horizontal directional drill and hydraulic or pneumatic air excavation technology. In all cases, install the utility pipe immediately, backfill with soil and soak within the same day. Installation of private utility improvements shall be tunnel bored beneath the tree and roots per *Trenching Tunneling & Distance Matrix* in Table 2-1.

TABLE 2-1
Trenching & Tunneling Distance

TRENCHING DISTANCE

When the Tree Diameter At 4.5 Ft Is:		Trenching will be Replaced with Boring at this Minimum Distance (10x tree dia.) from the Face of the Tree in any Direction:
6-9" Measured At 6”	à	6-9'
10-14" Measured At 54”	à	10-14'
15-19" Measured At 54”	à	15-19'
Over 19" Measured At 54”	à	20' +

DEPTH OF TUNNELING

Tree Diameter		Depth of Tunneling
9" Or Less Measured At 6”	à	2.5'
10-14" Measured At 54”	à	3.0'
15-19" Measured At 54”	à	3.5'
More Than 19" Measured At 54” Depth of Tunnel	à	4.0'

Bore Pits Shall Be Located At A Minimum Distance As Specified By The Trenching Distance Table Above.

1. Public Utilities
   Underground public utility improvements or repairs shall be performed in accordance with the *Utility Standards for Excavation, Trenching or Boring, Section 02200.309*; and per *Restriction Zones Near Regulated Trees* (*see Images 2.20-1 through 2.20-3*).

2. Street Trees
   Exclusions for *street trees* in the publicly owned right-of-way (ROW).

   - *Street Trees* that are in conflict with utility infrastructure where the conflict cannot be resolved may be removed if approved by Public Works Operations (e.g., a tree planted directly on top of a damaged sewer lateral.)

notes:

- Emergency utility repairs shall be exempt from the above restriction zones within the TPZ. The *City Arborist* shall be contacted after any such repairs that may result in significant tree damage or *removal*.

Required Practices

E. Injury Mitigation

A mitigation program is required if the approved development will cause drought stress, dust accumulation or soil *compaction* to trees that are to be saved. To help reduce impact *injury*, one or more of the following mitigation measures shall be implemented and supervised by the project arborist as follows:

1. Irrigation Program. Irrigate to wet the soil within the TPZ to a depth of 24-inches to 30-inches. Or, apply sub-surface irrigation at regular specified intervals by injecting on approximate 3-foot centers, 10-gallons of water per inch trunk diameter within the TPZ. Duration shall be until project completion or monthly until seasonal rainfall totals at least 8-inches of rain, unless specified otherwise by the *project arborist*.
2. Dust Control Program. During periods of extended drought, wind or grading, spray wash trunk, limbs and foliage to remove accumulated construction dust.
3. Soil Compaction Damage. *Compaction* of the soil is the largest killer of trees on construction sites due to suffocation of roots and ensuing decline of tree health. If a *compaction* event to the upper 12-inch soil horizon within the tree protection zone has or will occur by any means, then one or more of the of the following mitigation measures shall be implemented (*see Compaction and Grade Change, Section 2.20 A&B and Soil Improvement, Section 5.50*).
   - Type I Mitigation. If an approved paving, hardscape or other compromising material encroaches within the TPZ, an aeration system shall be designed by the *project arborist* and used within this area (subject to approval by the *City Arborist*).
   - Type II Mitigation. If inadvertent *compaction* of the soil has occurred within the TPZ, the soil shall be loosened by one or more of the following methods to promote favorable root conditions: *vertical mulching, soil fracturing*, core-venting, radial trenching or other method approved by the *City Arborist* (*see Soil Improvement, Section 5.50*).
   - Type III Mitigation. For City-owned improvements in the right-of-way, areas within the TPZ that will be improved (e.g., asphalt, concrete or pavement) soil shall be compacted to 95% proctor density. Unimproved areas (e.g., grass, open landscape strip, etc.) soil in the TPZ shall not exceed 85% by water jet *compaction*.

Required Practices

2.25 DAMAGE TO TREES

A. Reporting

Any damage or injury to trees shall be reported within 6-hours to the *project arborist* and job superintendent or *City Arborist* so that mitigation can take place. All mechanical or chemical *injury* to branches, trunk or to

roots over 2-inches in diameter shall be reported in the *monthly inspection report*. In the event of *injury*, the following mitigation and damage control measures shall apply:

notes:

1. Root injury: If trenches are cut and tree roots 2-inches or larger are encountered they must be cleanly cut back to a sound wood lateral root. The end of the root shall be covered with either a plastic bag and secured with tape or rubber band, or be coated with latex paint. All exposed root areas within the TPZ shall be backfilled or covered within one hour. Exposed roots may be kept from drying out by temporarily covering the roots and draping layered burlap or carpeting over the upper 3-feet of trench walls. The materials must be kept wet until backfilled to reduce evaporation from the trench walls.
2. Bark or trunk wounding: Current bark tracing and treatment methods shall be performed by a qualified tree care specialist within two days.
3. Scaffold branch or leaf canopy *injury*: Remove broken or torn branches back to an appropriate branch capable of resuming terminal growth within five days. If leaves are heat scorched from equipment exhaust pipes, consult the *project arborist* within 6 hours.

B. Penalty for damage to street trees

Required Practices
PAMC 8.04.070

In the event that *street trees* or their roots have been damaged, the contractor or property owner shall be subject to the penalty rate of $100.00 per inch of damage (City of Palo Alto, Current FY Fee Schedule - subject to change). Measurement of the damage shall be the width of the wound measured across the grain at the widest point. Penalty fee shall be paid to the City and deposited to the general fund as required.

notes:
Required Practices

2.30 INSPECTION SCHEDULE

The *project arborist* or Landscape Architect retained by the applicant shall conduct the following required inspections of construction sites containing *protected* and *designated trees*. Inspections shall verify that the type of tree protection and/or plantings are consistent with the standards outlined within this *Manual* and Conditions of Approval for discretionary projects. For each required inspection or meeting, a written summary of the changing tree related conditions, actions taken, and condition of trees shall be provided to the City of Palo Alto. *Monthly Inspection Reports* shall be faxed to the Planning Arborist at (650) 329-2154.

TABLE 2-2
Inspection Schedule

INSPECTION SCHEDULE

A. Inspection of Protective Tree Fencing. The *City Arborist* shall be in receipt of a written statement from the applicant or *project arborist* verifying that he has conducted a field inspection of the trees and that the protective tree fencing is in place prior to issuance of a demolition, grading, or building permit, unless otherwise approved *(see Verification of Tree Protection, Section 1.39).*

B. Pre-Construction Meeting. Prior to commencement of construction, the applicant or contractor shall conduct a pre-construction meeting to discuss tree protection with the job site superintendent, grading equipment operators, *project arborist, City Arborist,* and, if a city maintained irrigation system exists, the Parks Manager (Contact 650-496-6962).

C. Inspection of Rough Grading. The project arborist shall perform an inspection during the course of rough grading adjacent to the TPZ to ensure trees will not be injured by compaction, cut or fill, drainage and trenching, and if required, inspect aeration systems, tree wells, drains and special paving. The contractor shall provide the *project arborist* at least 48 hours advance notice of such activity.

D. Monthly Inspections. The *project arborist* shall perform monthly inspections to monitor changing conditions and tree health. The *City Arborist* shall be in receipt of an inspection summary during the first week of each calendar month or, immediately if there are any changes to the approved plans or protection measures *(see Monthly Inspection Report, Section 1.17).*

E. Special activity within the Tree Protection Zone. Work in this area (TPZ) requires the direct onsite supervision of the project arborist *(see Trenching, Excavation and Equipment, Section 2.20 C).*

F. Landscape Architect Inspection. For *discretionary development projects*, prior to temporary or final occupancy the applicant or contractor shall call for the Landscape Architect to perform an on site inspection of all plant stock, quality of the materials and planting *(see Quality, Section 5.20.1 A)* and that the irrigation is functioning consistent with the approved construction plans. The City shall be in receipt of written verification of Landscape Architect approval prior to scheduling the final inspection, unless otherwise approved.

2.40 PAVEMENT AND HARDSCAPE CONFLICTS WITH TREE ROOTS

Conflicts may occur when tree roots grow adjacent to paving, foundations, sidewalks or curbs (hardscape). Improper or careless extraction of the these elements can cause severe *injury* to the roots and instability or even death of the trees. The following alternatives must first be considered before root pruning within the TPZ of a *Regulated Tree*.

notes:

A. Removal and Replacement of Pavement or Sidewalk:

Required Practices

- Removal of existing pavement over tree roots shall include the following precautions: Break hardscape into manageable pieces with a jackhammer or pick and hand load the pieces onto a loader. The loader must remain on undisturbed pavement or off exposed roots. Do not remove base rock that has been exploited by established absorbing roots. Apply untreated wood chips over the exposed area within one hour, then wet the chips and base rock and keep moist until overlay surface is applied.
- Replacement of pavement or sidewalk: An alternative to the severance of roots greater than 2- inches in diameter should be considered before cutting roots. If an alternative is not feasible remove the sidewalk, grind roots only as approved by the Public Works Arborist and replace sidewalk using #3 dowels at the expansion joint if within 10-feet of a street tree. Use a wire mesh reinforcement within if within 10-feet of the trunk of a *protected* or *street tree*.

  Note: Any work in the right-of-way requires a street work permit from Public Works Department.

B. Alternative methods to prevent root cutting:

Recommended Practices

The following remedies should be considered before cutting tree roots that may result in tree instability or decline:

- Grinding a raised sidewalk edge.
- Ramping the walking surface over the roots or lifted slab with pliable paving.
- Routing the sidewalk around the tree roots.
- Install flexible paving or rubberized sections.
- On private property, new sidewalk or driveway design should consider alternatives to conventional pavement and sidewalk materials. Substitute permeable materials for typical asphalt or concrete overlay, sub-base or footings to consider are: permeable paving materials (such as ECO-Stone or RIMA pavers), interlocking pavers, flexible paving, wooden walkways, porches elevated on posts and brick or flagstone walkways on sand foundations.

C. Avoiding Conflict

Recommended Practices

Conflicts and associated costs can be avoided or reduced by the following planting practices:

- Plant deep rooted trees that are proven to be non-invasive.
- Over soil that shrinks and swells, install a sidewalk with higher strength that has wire mesh and/or expansion slip joint dowel reinforcement.
- Follow soil loosening planting techniques to promote deep rooting.

notes:

- Install root barrier only along the hardscape area of the tree (but allow roots to use open lawn or planter strip areas).
- Dedicate at least 10-linear feet of planting space for the growth of each tree.

Recommended Practices

D. Alternative Base Course Materials

When designing hardscape areas near trees, the project architect or engineer should consider the use of recommended base course material such as an engineered structural soil mix. The Palo Alto approved structural soil mix will allow a long term cost effective tree and infrastructure compatibility that is particularly suited for the following types development projects: repair or replacement of sidewalk greater than 40-feet in length; subdivisions with new street tree plantings; planting areas that are designed over structures or parking garages; confined parking lot medians and islands or other specialized conditions as warranted. (*see City of Palo Alto Public Works Improvement Specifications Standards and; www.amereq.com/cuintro*).

END OF SECTION

notes:

SECTION 3.00 - REMOVAL, REPLACEMENT AND PLANTING OF TREES

INTRODUCTION
A *Regulated Tree* may not be removed without City review and approval, except in certain emergencies. The purpose of City review is to verify that the removal is allowed under City law, and to prevent unnecessary tree removal. In some cases, a removed tree must be replaced by the property owner or, in the case of street trees, developer. This section describes the type and size of tree required, and the planting techniques to be used. It also describes how to determine the replacement value of a tree that cannot be replaced in its original location, and the circumstances in which the City may require a security deposit to assure the survival of trees during development projects.

3.05 TREE REMOVAL

A. Allowable Removal

A written permit is required to remove a *Regulated Tree*, except in emergency situations outlined in Hazardous Trees, Section 4.00. *Removal* of *Regulated Trees* is allowed if:

- A *Protected Tree* is determined to be dead, hazardous (*see Hazardous trees, Section 4.0*), a detriment to or crowding an adjacent *protected tree*, or a *Public Nuisance* (*see Section 1.00*).
- A *protected tree* trunk is touching or the basal flare is under the building footprint of an existing building (for example, uplifting foundation, contact or damage to eves, gutter, etc.).
- On projects other than a single family residence, a *Protected Tree* if it reduces the otherwise-permissible *Buildable Area* by more than 25%.
- Other specific circumstances exist, as described in Section 8.10.050, Appendix A.
- In the case of *street trees*, Public Works Operations issues a written approval.
- In the case of a *Designated Tree* shown on previously approved site or landscape plans, the Director approves the removal in writing.

B. Permit Application

Required Practices

Tree Removal Applications are available at the City of Palo Alto, Development Center, 285 Hamilton Avenue, Palo Alto, CA 94301, 650-617-3118. The following is a checklist of items necessary for City review for tree removal. Additional information may be required by the reviewing staff. Response will generally be mailed to the applicant within 10 days. The removal permit must be on site during the *removal*.

notes:

Tree Removal Checklist

- ❑ Completed City of Palo Alto Protected Tree Removal Application (available at the City of Palo Alto, Development Center, 285 Hamilton Avenue, Palo Alto, CA 94301. (650) 617-3118).
- ❑ Payment of $145.00 review process fee ($125 Schedule Fee and $20 Records Management)
- ❑ Arborist letter report from a *certified arborist* on company letterhead (*see Tips for Selecting an Arborist, Section 5.95, and Tree Reports, Section 6.10*) — to include the following information for each tree:
- ❑ A written narrative describing the tree species (common and scientific); location (in relation to street, structures and property line); size (DBH, height & crown spread); condition (foliage, vigor, structural integrity, etc.); life expectancy and prognosis (is the tree *hazardous*, severe decline, property damage, etc.?)

C. Hazard Trees

To remove a *protected* or *designated* tree that has been verified as *hazardous*, as defined within Chapter 8.10 of the Palo Alto Municipal Code and *Tree Technical Manual*, written approval from the *City Arborist* is required and must be available on site when the tree is being removed, unless emergency conditions exit (*see Emergency Removal Conditions, Section 4.00*).

Required Practices

3.10 WHEN TREE REPLACEMENT IS REQUIRED

Replacement Trees. Certain conditions determine whether or not a *protected* or *designated tree* must be replaced. In summary, they are:

PAMC 8.10.050

A. Protected Trees

If the City authorizes removal of a protected tree because it is dead, dangerous, or a nuisance, no tree replacement is required. In all other cases, the tree must be replaced.

B. Designated Trees

When authorizing removal of a *Designated Tree*, the Director or the Director's designee shall require tree replacement if it is necessary or desirable to implement the intent of the original site design. The number and nature of the replacement trees shall be determined by the Director or designee, taking into consideration the value of the tree removed and the site design.

PAMC 8.04.070

C. Street Trees

If the City authorizes removal of a street tree in connection with a development project, it shall specify the replacement requirements in the permit authorizing removal.

3.15 ALTERNATIVES WHEN TREES CANNOT BE REPLACED ON SITE

notes:

In some circumstances, crowding or other physical constraints make it impossible or undesirable to replace a tree of equal value in the same place. In that case, the value of the tree shall be computed under the Tree Value Replacement Standard in Section 3.25. Once the value has been determined, that sum of money shall be used in the following order of preference, as approved by the Director: (1) to provide additional trees elsewhere on the site; (2) to add or replace street trees or other public landscaping in the vicinity, or (3) to add trees or other landscaping to other City property.

3.20 TREE CANOPY REPLACEMENT STANDARD FOR ONSITE TREE REPLACEMENT

Required Practices

When a *Protected* or *Designated Tree* is to be replaced on site, the following standards apply.

A. Species

The replacement trees shall be the same species unless the Director determines that another species would be more suitable for the location. Factors to be considered include the long term health of the tree in the location and its compatibility with the adjacent uses as well as design considerations.

B. Location

The location of the replacement tree on site shall be approved by the Director. If it is not possible or desirable to replace the tree on site, Section 3.15 shall apply.

notes:

C. Size and Number

Often it is not possible to replace a large, older tree with a single equivalent tree. In such cases, the following tree canopy replacement ratio shall be used:

TABLE 3-1
Tree Canopy - Replacement Standard

COLUMN 1	COLUMN 2	COLUMN 3
Canopy of the Removed Tree (Avg. dist. across the canopy*)	Replacement Trees	Alternative Tree
4'-9'	Two 24" Box Size (minimum)	One 36" Box Size
10'-27'	Three 24" Box Size	Two 36" Box Size
28'-40'	Four 24" Box Size	Two 48" Box Size
40'-56'	Six 24" Box Size	Two 48" Box & Two 36" Box Size
56'-60'	Two 24" Box & Two 36" Box + Two 48" Box Size	**
60'+	**	**

*Add half of the difference between the two to the narrowest measurement for the average canopy.
** Replace the tree with a combination of both Tree Canopy and Tree Value Standards.

Note: Basis of this table is determined by the growth of one 24" box size tree, growing at a rate equivalent to 9 feet of canopy over the course of ten years.

How to use Table 3-1, Tree Canopy Replacement Table.

- Column 1. Determine the leaf canopy of the removed tree by measuring the distance across the canopy at the widest point and narrowest point. Add half of the difference between the two to the narrowest measurement for the average canopy. The leaf canopy diameter of the tree (this information is typically supplied within the arborist report) is used to determine number and size of replacement trees in Column 2.
- Column 2. Determine the number of replacement trees. The planting of new trees should equal the leaf canopy of the removed tree within a period of ten years. The minimum replacement for removal of any *Protected or Designated Tree* shall be two 24-inch box trees.
- Column 3. Alternative size of trees may be desired. The property owner shall have the option to plant an alternative size tree to accommodate site specific landscape needs or constraints, such as space, design or soil volume limitations.

Example of Tree Canopy Replacement Ratio:

The removal of a tree with a 39' crown spread will require four 24-inch box trees to satisfy the criteria of this Section. Methodology- e.g. the average canopy of a new tree is 4' wide + the expected canopy growth of 6" per year x 10 years = a 9' net canopy of one replacement tree. Thus, four 9' trees = 36' of new canopy, and is a close approximate to the original 39' canopy tree.

3.25 TREE VALUE REPLACEMENT STANDARD

notes:

When the value of a tree needs to be determined for establishing the amount of security required, or for any other purpose, the value shall be determined by using the most recent edition of the *Guide for Plant Appraisal* published by the Council of Tree and Landscape Appraisers (*see Section 6.45.)*

3.26 SECURITY DEPOSITS

As a condition of a development approval, the Director may require that the developer post security of between 25% and 100% of the value of the trees to be preserved, as determined under Section 3.25. The security may be a cash deposit, letter of credit, or surety bond and shall be filed with the Finance Department. It shall be in a form satisfactory to the City Attorney. The security shall be posted before issuance of any grading or building permits. The guarantee period shall be specified; in general, it shall be at least two years after expected completion of construction. If the trees fail to survive, the developer shall replace them; if the developer fails to do so, the City may use the security to provide off site trees and/or landscaping as described in Section 3.15.

3.30 TREE AND SHRUB PLANTING SPECIFICATIONS

Required Practices

Planting specifications apply for trees and shrubs that are: 1) planted as a replacement for a *Regulated Tree*, 2) to be planted as a *street tree* within the City right-of-way or other public land; or 3) planted as part of a landscape plan subject to non-residential development approval (*see Discretionary Development Approval, Section 1.11*). Using the following specifications will result in consistent city-wide plantings, and superior tree growth and vitality. To achieve this, the landscape architect shall incorporate these items into their specifications.

3.35 PLANTING STOCK AND MATERIALS

A. Quality

Required Practices

It is the contractor's responsibility to supply stock that meets ANSI 760.1-1996 and City of Palo Alto *Tree Technical Manual Standards*.

- All plants and trees installed within the City of Palo Alto shall conform with American Association of Standards, ANSI Z60.1, *Specifications for Acceptance of Nursery Trees at the Time of Delivery*, in all ways.
- Plants shall be sound, healthy, vigorous, and free of plant disease and insect pests and their eggs.
- Container stock shall be grown for at least 8-months in containers in which delivered and shall not be root bound or have girdling roots.
- Trees shall not have been topped or headed.
- Landscape Architect shall inspect and verify, in writing, that all plant material to be installed on the site meets the above standards and is acceptable.
    - The written verification shall be forwarded to the City Planning Department files within one week of acceptance (*see Inspections, Section 2.30 F)*.
    - Inspection shall occur after delivery of stock to the project site.

notes:

- Plants and trees with broken tops, branches or injured trunks shall be rejected.

Required Practices

B. Miscellaneous Materials

The following materials shall be used unless otherwise specified:

- Tree stakes. Support stakes shall be treated 2-inch diameter Lodgepole Pine, two stakes per tree or approved equivalent. No cross brace shall be used. After installation, stakes shall be trimmed so that the branches clear the top of the stake.
- Tree Ties. 'V.I.T' Tree Supports (recommended) or equivalent, twist brace, fabric-reinforced rubber (3/8-inch minimum), or equivalent approved by the City of Palo Alto shall be used and installed in a figure eight fashion to support the tree to the stakes.
- Mulch. Screened untreated wood chips 1/2- to 1-inch in size, spread to a 2-inch depth out to the edge of the root ball. The mulch should be kept at least two inches away from the trunk and shall be applied to each tree (*see Mulching, Section 3.45-G*).
- Root Control Barriers. Use along all public sidewalks, and indicate on approved plans and drawings. 18-inch Linear Barrier LB18-2 root control barrier shall be used. Unless specified otherwise, a 10-foot length shall be placed on center with the tree and on the sidewalk side only. Root barrier boxes are not approved.
- Mower guards. For trees in turf areas requiring regular mowing, the tree stem shall be protected with TreeGuard or equivalent.
- Tree Grates. Where sidewalk width is less than 8-feet and new trees will be installed in a tree well, metal tree grates shall be used and approved by Public Works. Minimum size grates shall be 4' x 4' unless specified otherwise. All tree grates shall be mounted in frames, frames inset into a concrete foundation within the sidewalk or surface material and shall be flush with the surrounding surface.

3.40 PLANTING SITE PREPARATION

Required Practices

A. Soil Preparation and Conditioning

- All debris, wood chips, pavement, concrete and rocks over 2-inches in diameter shall be removed from the planting pit to a minimum of 24-inch depth, unless specified otherwise (*see also Soil Improvement, Section 5.50*).

Required Practices

B. Planter Pit

- Trees in a confined planter pit or sidewalk area: The planting hole shall be excavated to a minimum of 30-inches deep x the width of the exposed area. Scarify the sides of the pit (*see Placing the Tree, Section 3.45 D*). Soil beneath the rootball shall be compacted to prevent settling.

- Trees in all other areas: Excavate the hole's width a minimum of three times the diameter of the container, and deep enough to allow the root ball of the container to rest on firm soil. Scarify the sides and the bottom of the pit.
- The height of the container root ball should be 1-2-inches higher than grade level (*see Placing the Tree, 3.50*), except when structural urban tree soil mix is used (*see Alternative Base Course Materials, Section 2.40 D*), in which case the tree may be planted at level grade.

notes:

C. Drainage

1. Poor drainage. For *discretionary development projects*, a percolation test is required to ensure there is adequate drainage for planting new trees. A minimum of one test per site shall be reviewed with the *project arborist* or Landscape Architect prior to plant installation. One or more of the following mitigations are required for locations with poor drainage.

Required Practices

2. Mitigation for locations with poor drainage:

Required Practices

   - Install french drain. The trench shall radiate away from the tree and be a minimum of 18-inches in depth filled with drain rock. The grade shall fall away from the tree trunk.
   - Install drain tiles or perforated pipe directing water away from the tree.
   - Install a drain chimney at the bottom of the planting pit, a minimum of 4-inches in diameter and filled with medium sand or fine gravel to ensure percolation of all water from the filled planter pit. Auger bore drain holes to penetrate hard pan or cileechee clay a minimum of 12-inches into undisturbed pervious soil. Angle the boring as close to vertical as possible.

3. Planting Percolation Test. A minimum of one test per development site is required. Additional tests may be needed as required by Landscape Architect or *City Arborist*. Fill planting hole with water, provide drainage that is greater than 2-inches per hour. If percolation is less, one or more of the following mitigation measures must be implemented for tree planting *(see Soil Improvement, Section 5.50)*.

Required Practices

D. Aeration tubes for trees

Required Practices

- *Street trees* planted in the City right-of-way, sidewalk planter pits, planting strip, medians or *designated trees* when specifically required in development plans, shall use 4-inch diameter perforated aeration piping (rigid or flexible), circling the bottom of the planter connected to a 'T' fitting to two riser tubes with grated caps and wrapped with filter fabric, per Public Works Planting Detail #503 for tree wells or #504 for planter strip planting (*see Appendix H*). This detail shall be shown on the approved landscape plans.
- All other trees (*see Aeration TubeTable, 3-2*) shall be planted with 4-inch diameter perforated aeration tubes with grated plastic caps placed at the edge of the root ball to the bottom of the pit per Table 3-2, Aeration Tubes. Irrigation heads shall not be installed inside the aeration pipes.

notes:

- Any of the above holes, pipes, grates or fixtures shall include the installation of Filter Fabric wrap over the side openings and secured as recommended by manufacturer when connected to an approved aeration system.

TABLE 3-2
Aeration Tubes

AERATION TUBE TABLE	
TREE SIZE	NUMBER OF TUBES
15 gallon trees	one tube
24' box trees	two tubes
36' box trees	two tubes
48' box trees or larger	four tubes or as needed

3.45 PLANTING THE TREE

Required Practices

A. Perform percolation test

If the soil is dry, add a few inches of water in the hole. Let it drain before planting the tree (*see Percolation Test, Section 3.40 C*).

B. Depth

To check the proper depth of the rootball, place the tree in the hole and lay a pole or shovel across the original grade - the top of the root ball should be 1 to 2-inches higher (*see notes on depth, Section 3.40 B*).

C. Container and Roots

Remove tree from the container and trim the root ball in the following way:

- Thick circling roots: straighten and/or cut cleanly
- Thin roots: make three to four vertical cuts 1/2-inch deep around root ball, spread the bottom out if necessary

D. Placing the Tree

Locate the tree in the hole, and rotate the tree to direct the main branches away from the street side, if possible.

E. Filling the Hole

Place the aeration tubes, fill the hole halfway up with original soil (amended soil only when approved), and gently tamp out air pockets with a pole or shovel handle. Add about 1-inch of water, and let drain. Fill the rest of the hole to grade, water the fill soil, and let drain.

F. Staking

Place the stakes at the edge of the root ball (drive them 2-feet into undisturbed ground), and avoid contact with the branches. If in a windy area, set the stakes in a plane at right angles to the wind. Remove the nursery stake. Loosely place two ties in a figure eight around the trunk, as low as needed to hold the tree upright and nail to the stake. Stakes shall be trimmed so that the branches clear the top of the stake. Do not install a cross-brace.

G. Berm, Mulch and Water

In non-turf areas, form a soil berm 3 to 4-inches high at the outermost edge of the root ball. Place 1 to 2-inches of mulch or bark over root ball and berm, keeping the mulch away from the trunk a minimum of 2-inches. Fill the berm with water to capacity (*see Watering 5.45, Section A*).

notes:

3.50 PLANTING IN DIFFICULT SOIL CONDITIONS

Recommended Practices

A. Turf Areas

In turf areas that receive regular watering, the watering berm may be eliminated. The turf shall be maintained a minimum of one foot from the new tree stem, and mulch placed on top of the rootball. The mulch shall not be touching the tree stem. In turf areas, install tree guard (*see Mower Guards, Section 3.35 B*).

B. Alternate Specifications

Occasionally, tree planting must occur in poor or difficult soil where standard planting techniques will result in poor-to-average performance or mortality (such as unique or unusual regional geology, slope, soil volume, restrictive physical or chemical properties, poor drainage, etc.). In this case, the responsible party must investigate alternative solutions to enable long term tree growth. Alternative planting specifications or plans that vary from the native or typical soil conditions shall be submitted to the *City Arborist* for approval prior to installation.

- Alternative or specified soils, such as engineered, amended or structural urban tree soil mix, including written specifications and physical samples, shall be submitted for approval from the *City Arborist* and/or Landscape Architect (*see Alternative Base Course Materials, Section 2.40 D*).

END OF SECTION

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notes:

SECTION 4.00 HAZARDOUS TREES

INTRODUCTION
Property owners are responsible for the trees on their own property. The City does not require advance permission for removal of *Protected* or *Designated Trees* in emergencies. However, it does require documentation of the problem after the fact. This is to avoid the unlawful removal of sound trees on the grounds that they are hazardous. If there is no immediate danger, and the structural deficiency can be corrected, it should be. If the City determines that there was no reasonable basis for believing there was an emergency, the property owner may face penalties for violating City law.

The health and safety of a tree are two distinct and separate functional characteristics. A vigorous and healthy tree may not necessarily be of sound wood or structure. To remove a dangerous *protected* or *designated tree*, it must first be evaluated and the tree determined to be *"hazardous"* as defined in this section. This must be verified in writing by the *City Arborist* before the tree can be *removed*. (*see also Removal, Replacement and Planting Trees, Section 3.00, and ISA Hazard Evaluation Form, Section 4.20 B*).

A. Tree Hazard Responsibility

On private property, it is the responsibility of the property owner to mitigate or abate a known hazardous condition of a *protected* or *designated tree* that may be of questionable structure or deemed as hazardous. Most tree hazards can be prevented with regular checkups by a tree care professional and timely maintenance action by the property owner. Street trees on city property that may be a public safety hazard should be reported to the City of Palo Alto, Public Works — Operations at (650) 496-5953.

B. Recognizing Tree Hazards

Required Practices

Determining whether or not a tree's defects constitutes a condition that presents an imminent hazard to an area requires a high degree of knowledge and experience. Hazard tree assessment of a *protected* or *designated tree* should only be evaluated by an arborist who is familiar with tree physiology and can interpret the external signs of weaknesses, who can perform internal checks if necessary and recommend mitigation (*see Hazard Reduction and Prevention, Section 4.40, and Hazard Evaluation Form, Section 4.20 B*).

4.10 EMERGENCY REMOVAL CONDITIONS

A. Abatement

When a tree has partially failed or it is apparent it is about to fail and persons or property are threatened the tree may be removed without City review or approval. The City does not require an arborist report before the removal in this instance.

notes:

B. Authorization

Such cases must be substantiated after the fact by the property owner and tree professional with photographs, abatement information, insurance claim or other relevant information and completion of a Protected Tree Removal Application. The information is to be submitted to the City Planning Division Arborist within five days of emergency *removal*. All other authorizations are subject to the standard procedure outlined in *Removal of Protected Trees, Section 3.05.*

Required Practices

4.20 CRITERIA USED BY THE CITY TO DETERMINE IF A TREE IS HAZARDOUS

A. Definition of Hazardous

Palo Alto Municipal Code Chapter 8.10.020 defines *'Hazardous'* as: an imminent hazard or threat to the safety of persons or property. If a tree possesses a structural defect that may cause the tree or part of the tree to fall on someone or something of value (i.e. *'target'*), and the condition is determined to be imminent, the tree is considered *hazardous*.

B. Evaluation Form

The City uses the national standard, an ISA - HAZARD EVALUATION FORM (*see Appendix C*) as a basis to determine the hazard rating of a tree (*see Hazard Rating, Section 4.25*). This form, or an approved equivalent, must be completed by a *certified arborist*. The *City Arborist* retains discretionary right to approve, request in writing a second opinion of a rating, in writing, or recommend action that may reduce the condition to a less-than significant level of hazard.

C. Authorization

If the *hazardous* condition or *target* cannot be mitigated or reduced to a less than significant level (*see Hazard Reduction and Prevention, Section 4.40*) then the tree shall be authorized by the City and removed by the property owner to abate the condition.

Required Practices

4.25 DETERMINING A TREE'S HAZARD RATING

For the purpose of removal, if a tree is declared a hazard it must be rated for the level of hazard to persons or property by using the Hazard Rating Formula, or other professional methodology acceptable to the City of Palo Alto (*see Hazard rating formula Table 4-1 and Appendix C*):

TABLE 4-1
Hazard Rating Formula

ISA - HAZARD RATING FORMULA International Society of Arboriculture			
Failure Potential	**+ Target**	**+ Additional Factors/Size of Part**	**= Hazard Rating**
	+	**+**	**=**
1 = low **4 = severe**	**1 = low** **4 = severe**	**1 = low** **4 = severe**	**3 = low** **12 = severe**

Note: The above factors are combined to quantify a hazard rating. For example, a minimum rating of 3 is the safest (a low predicable hazard), and the maximum rating of 12 is an imminent hazard (a high predictable hazard). Further details regarding this formula can be found in the ISA- HAZARD EVALUATION FORM (see Appendix C) and the ISA publication * Evaluation of Hazard Trees in Urban Areas, most current edition.

notes:

A. Failure Potential Rating

Failures do not occur at random, but are the result of a combination of defects and aggravating conditions. The scope of the professional evaluation will include structural defects in the tree (including branches, trunk and roots; and if necessary, shall employ the use of the most current methods of internal decay inspection available); soil/slope and/or creek bank stability; individual species susceptibility to failure; pruning; history; decay weaknesses and any other compromising or pertinent factors considered by the consultant.

B. Target Rating

Evaluation of potential targets shall include people, structures or property use and occupancy that are imminently threatened. Property use shall consider what structures or activities are under or around the tree (e.g. building, parking, pedestrian, recreational, utility lines, hardscape, etc.). Occupancy shall consider frequency of the use (occasional, intermittent, frequent or constant), and whether the *target* will be present when failure occurs.

- Consideration shall be given as to whether the *target* can be reasonably removed or isolated to reduce the hazard rating to a less than significant level. A target means people or property (public or private).
- A tree may be a potential hazard if it is: (a) a tree with the potential to fail; (b) in an environment that increases the likelihood of failure and; (c) a tree that would strike a *target*.

C. Additional Factors

Evaluation of other factors that contribute to aggravating conditions shall be considered, such as: size of the affected defect (i.e. a small branch vs. the entire tree uprooting); significant potential of fire, utility line contact or catastrophic effects, etc.

Recommended Practices

4.30 TREE EVALUATION CHECKLIST

This part is intended to further help the property owner understand tree defects and how they may be interpreted by an arborist. Many tree defects are not readily apparent because decay or structural damage may be internal. Also, poor tree health may not reflect poor tree structure. *Hazardous* trees must be carefully evaluated. The following checklist of criteria that is typically used by professionals may indicate potential or current tree hazards. The checklist is not meant to be a comprehensive guide, however, it is an outline of indicators that may alert a property owner to potential hazards and suggest action to avert a tree failure and liability. If you answer 'yes' to one or more of the checklist items, you should contact an arborist to discuss how to reduce the potential hazard.

A. Hazard Evaluation Questionnaire

- Target: If the tree or branch falls will it hit cars, houses, structures, power lines or people? If so, immediate action may be necessary.
- Dead Branches: Are there dead tops or branches? Is the tree dead?
- Cracks: Are there deep, open cracks in the trunk or branches? These are major starting points for trunk and branch failure.

notes:

- Crotch Cracks: Are there deep, open cracks below joining trunks or stems?
- Tree Architecture: Has the tree grown beyond its species specific shape into a hazardous form? Is the tree leaning?
- History: Has the tree recently lost large branches?
- Edge Tree: Were neighboring trees recently removed, leaving tall trees exposed at the edge that may be subject to unexpected wind dynamics and blow-over?
- Living Branches: Do live branches bend abruptly upward or downward where tips of large branches were cut off? These may pull out of trunks that are weakened by rot or cracks. Beware of large branches on rotten or cracked trunks.
- *Topping:* Are large branches growing rapidly from topping cuts? These sprouts have weak attachments and may weaken further as they grow. Is there decay below topping cuts?
- Storm *injury*: Are there broken branches, split trunks, or injured roots? Are branches close to power lines?
- Root Rot: Are there fungus fruit bodies (mushrooms) on roots or near the trunk? Were roots injured by construction?
- Rots and Cankers: Are there hollows or cankers (dead spots) in the trunk or major branches, some with fungus fruit bodies?
- Construction *injury*: Have roots, trunk, or branches been injured?
- Is there a new lawn or garden over injured roots? The added fertilizer may stimulate the growth of fungi that will rot the supporting roots while the top gets heavier. A moderate storm could cause the tree to fall.
- Guying of trees. Staking and guying of small to medium size trees may benefit from the additional support. Discretion must be exercised that the guying does not hide weaknesses, such as toppling over, that result from poor quality nursery stock or girdling roots.

4.40 HAZARD REDUCTION AND PREVENTION

Recommended Practices

Review the following list to reduce hazardous conditions.

- Plant trees that are not problematic and that fit the site
  The International Society of Arboriculture (ISA) has developed a list to assist you to avoid planting a tree that may become a problem (*see Inherent Failure Patterns for Selected Species, Appendix D*).
- A healthy, vigorous tree that receives regular care is less likely to become *hazardous* than one that is ignored. Prevention is the best solution to the tree hazard problem.
- The risk of a hazard tree may be reduced by removing dead and broken branches, reducing branch end weights, by mechanically supporting weak branches from below, or by cabling and bracing.

In some cases, *targets* may be removed such as by moving picnic tables or other items beneath a precarious tree, fencing to prevent access to such trees, or rerouting pedestrian or vehicular traffic.

- If there are no other options to abate the hazard, the tree may need to be removed entirely (*see Removing a Hazardous Tree, Section 4.10*). Steps outlined in the Tree Removal Procedure (*see Section 3.05*) should be submitted as soon as possible for review by the City.

notes:

The following checklist will help property owners avoid future problems:

- ❑ Inspect your trees carefully at least once each season every year. Annually, have a *Certified Arborist* inspect your trees and provide you with a written report.
- ❑ Avoid planting brittle species where falling limbs could injure people or property (*see Inherent Failure Patterns for Selected Species,Appendix D*).
- ❑ Prune trees when they are young (*see Pruning Young Trees, Section 5.30*) and regularly thereafter.
- ❑ Use correct pruning methods, always making the pruning cut outside the branch collar. This will allow only the minimum of decay infection.
- ❑ Do not allow *topping* (*see Definition, Section 1.32*).
- ❑ Always plant the right tree in the right place. Select trees based upon their mature height and shape, and make sure the species selected matches the soil and other site characteristics. For example, avoid planting tall-growing trees such as redwoods near power lines or too close to your house (*see Inherent Failure Patterns for Selected Species, Appendix D)*.
- ❑ Water thoroughly (generally, until saturation is reached) during dry periods, slowly applying at least 2-inches of water per week (*see Watering, Section 5.45*).
- ❑ Erect barriers around or slightly beyond the root protection zone of trees during construction. Insist that these root protection zones be honored by construction workers.
- ❑ Consider cabling or bracing weak forks of branches in larger trees of high value.
- ❑ Do not plant trees with a narrowly-forked stem v-crotch, imbedded bark or girdling root ball.
- ❑ Where a valuable specimen tree may be suspected of developing into a *hazardous* tree, use landscaping to keep people at a safe distance. This may require techniques such as rerouting walks, moving patio furniture, or planting shrubs and hedges to function as barriers to keep foot traffic at a safe distance (*see Determining if a Tree is Hazardous, Section 4.20*).

END OF SECTION

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notes:

SECTION 5.00 TREE MAINTENANCE GUIDELINES

INTRODUCTION
This chapter establishes the minimum standard of care and maintenance of Palo Alto's *Regulated Trees*. These standards apply to all persons who own or are engaged in the business of repairing, maintaining, or preserving these trees. The following standards of care are set forth for pruning (including utility, fire and traffic encroachment), planting, watering, soil and nutrient requirements, insect, disease and fruit control. Guidelines for selecting an arborist are also given. These standards and guidelines are based on sound arboricultural principles and are applicable to trees, shrubs and woody plants.

SECTION 5.05 CARE OF REGULATED TREES

Required Practices

All owners of *Regulated Trees* are to follow the required maintenance standards set forth in this *Manual*. If special pruning or situations require a variance from these Standards, it is the responsibility of the project arborist and property owner to clarify why the changes are needed and review them with the City Arborist.

SECTION 5.10 PROHIBITED ACTS

Required Practices

Improper maintenance may constitute a prohibited act as defined by the Palo Alto Municipal Code, Chapter 8.10.050 and a violation which may be subject to penalty. The following permitted and prohibited maintenance practices for *protected* and *designated trees* apply.

A. Excessive Pruning

Except for clearance pruning of utility lines, traffic or abating a *Public Nuisance, excessive pruning* (*see Excessive Pruning, Section 1.15*) shall be considered a prohibited act.

B. Topping

Topping shall be considered a prohibited act (*see Topping, Section 1.33*). Seek alternatives to topping (*see Crown Reduction, Section 5.20-A*).

C. Other prohibited actions

Taking any action foreseeably leading to the death of a tree or permanent damage to its health, including but not limited to excessive pruning, cutting, girdling, poisoning, over watering, unauthorized relocation or transportation of a tree, or trenching, excavating, altering the grade, or paving within the dripline area of a tree (*see Palo Alto Municipal Code Chapter 8.10.020, Appendix A*).

5.15 STANDARDS FOR PRUNING REGULATED TREES

Required Practices

The most compelling reason to prune trees is to develop a strong, safe framework. All work to be performed on *Regulated Trees* shall be in accordance with the following standards.

notes:

Required Practices

A. Specifications

All specifications for working on *protected* and *designated trees* shall be written and shall be administered by a qualified arborist, and shall be designed to promote the preservation of tree structure and health.

B. Industry Standards

All work on *Regulated Trees* shall be in accordance with the most current edition of the following industry standards: (*see Performance Standards. Standard Practices for Tree Care Operations - ANSI A300-1995 Appendix G; Safety Standards, ANSI Z133.1-1994, Appendix F; and Tree Pruning Guidelines, Appendix E*).

Required Practices

5.20 PRUNING MATURE TREES

There are six types of pruning that may be required for use on mature *Regulated Trees (see ISA Tree Pruning Guidelines, Appendix E)*. Prior to entering the tree, the tree worker is required to be familiar with these types of pruning as stated in the Performance Standards, ANSI, A300-1995. 'Species-specific' pruning promotes the natural shape of the tree (i.e. excurrent, decurrent, vase-shaped, fast growing, etc.).

A. Types of Pruning

- Crown Cleaning
- Crown Thinning
- Crown Raising
- Crown Restoration
- Crown Reduction
- Utility Pruning

B. Tree Injury

Climbing and pruning practices shall not injure the tree except for the pruning cuts.

C. Timing of Pruning

Recommended Practices

To reduce the probability of insect infestation, disease or infection, the following seasonal restrictions apply, except when public safety is a concern (*see Tree Pruning, Surgery and Removal, Section 2.15-F*):

- Pine (*Pinus spp.*) or Elm (*Ulmus spp.*): Do not prune May-October
- All species: Do not prune during the flush of spring shoot growth
- Trees with thin bark: Do not prune in summer when sun scald injury may be a factor
- Deciduous trees (leafless in winter): Best pruned November-February
- Hazardous trees of any species may be pruned any time of the year for abatement reasons

5.25 PRUNING DISTRESSED TREES

notes:
Recommended Practices

Distressed trees require as much leaf area as possible to overcome stressed conditions. To avoid additional injury, the following measures shall be followed for these trees.

A. Injury or Disturbance

If a tree has been damaged by injury or disturbance, delay pruning until deadwood becomes evident (typically 1-3 years after injury). Crown cleaning is then recommended.

B. Neglect

Trees that have received little or no care or maintenance may need moderate crown thinning, reduction of end weights or entire crown restoration.

5.30 PRUNING YOUNG TREES

Recommended Practices

The average life expectancy for trees growing in harsh urban conditions is 7-10 years. By pruning trees early, it will improve life expectancy and is a proven, cost-effective measure. Added benefits are also reflected in safer trees with fewer branch failures. For trees that serve as a replacement for a *protected* or *designated trees*, they shall be pruned in the following way:

- Young trees should be pruned during the second year after planting to improve their structure, and only minor crown cleaning every 3-7 years thereafter. Refer to *ISA Tree Pruning Guidelines* (*see Appendix E*).
- Do not top the main leader except to position the lowest main branch. Other main branches should be spaced at least 18-inches apart to alleviate a tight grouping branches.
- Select permanent branching and allow temporary low branching on the lowest part of the trunk to remain.

5.40 FERTILIZING STANDARDS

This section outlines performance standards for fertilizing and apply only if fertilizing is specified. Fertilizing mature trees is generally not necessary. Fertilizing may be specified for trees that will be impacted by upcoming disturbance, grade changes or a modified environment. Benefits gained from the increase stored resources may aid the tree to overcome the stress caused by disturbance.

A. Specifications

Recommended Practices

Fertilizing, if specified, shall be performed to the following standards:

- Method of application: The method shall be subsurface injection, on approximate 3-foot centers (within the root ball on young trees; 2-feet out on older trees) and out to the approximate dripline perimeter. Specific situations may justify other variations such as vertical mulch, soil-fracture or surface-broadcast methods.
- Material and Rates: Unless specified otherwise, fertilizer formula shall be a slow-release, complete fertilizer with chelate trace elements (e.g. 22-14-14 or 20-20-20) and mixed at label rates not to exceed 4-pounds nitrogen per 100-gallons of water. Extraordinary cases may require soil and tissue sampling to correct target deficiencies.

notes:

- Amount: Unless specified otherwise, volume shall be determined by mixing 10-gallons of water per inch of trunk diameter when measured at 54-inches above natural grade.
- Timing: Timing should not be detrimental to tree health. Best results are derived from applications made during the prior growing season. Apply fertilizer between May through September for best results.

5.45 WATERING SCHEDULE

Required Practices

Newly installed trees planted, including drought tolerant species, are dependent upon supplemental irrigation until established, typically for two years. Periods of extreme heat, wind or drought may require more or less water than recommended in these specifications. The method and amount that is applied may vary depending upon soil composition, heat, wind, planted in turf or ground cover, periods of abnormal rainfall or in poorly drained soils (*see Drainage, Section 3.40-C*). The watering of *protected* or *designated trees* or their replacements shall follow these standards:

A. New trees

During the establishment period (1-2 years) trees should be watered thoroughly to their root depth as frequently as needed. A watering schedule is to be submitted at the preconstruction meeting. The schedule is to include watering frequency and quantity. The minimum standards shall be as follows:

- 1-3 months in the ground: 4 times per month or as necessary
- 4-6 months in the ground: 2 times per month or as necessary
- 7-12 months in the ground: 1 time per month or as necessary

B. Mature trees

- Most species: 1 time per month during irrigation season (usually March through September)
- Coast Live Oak, Valley Oak and Blue Oak: deep water in May and September — do not water during other months. For oaks already in the vicinity of irrigated conditions,automatic sprinklers or regular watering shall not be allowed to spray on or within three feet of the trunk. The water shall not be allowed to pool or drain towards the trunk.

C. Watering Methods

The following options shall fulfill the watering requirements. One or more of the following may be utilized dependent upon unique circumstances subject to the *City Arborist* determination. The options are as follows:

PAMC 12.32.040

1. Automated Watering Systems. All new *street trees* planted within the right-of-way and *designated trees* shall be provided with one of the following automatic watering systems. All tree irrigation is to be consistent with current *Landscape Water Efficiency Standards for the City of Palo Alto.* Other city maintained systems shall be per Parks Department specifications.

- Bubbler heads (Preferred). One or two bubbler heads mounted on flexible tubing are to be placed adjacent to or on top of the root ball. The placement of bubbler within an aeration tube is not allowed.
- Drip Loop system. A continuous loop of drip tubing circling around the trunk at a point two-thirds out from the trunk to the edge of the root ball (for new trees 36-inch box size and greater, a second loop of drip tubing is required at a point just beyond the root ball on native soil).
- Hand watering systems. Recommended for trees that are part of a development project that must be watered to insure tree survival during the course of construction until automatic irrigation is installed.
- Flood watering. Newly installed trees must be 'flood or basin-watered' on top of the root ball to allow the water to infiltrate through the root zone.
- Subsurface injections using a hydraulic spray pump (practical for use in hard, compacted soils or steep hillsides).
- Soaker hose. Slow, deep watering using a garden type soaker hose.
- Wetting agent. A root ball that has been allowed to dry out beyond the wilting point shall require the addition of a wetting agent to the water (such as Aqua-grow or equivalent).

notes:

D. Amount

Unless otherwise specified, the volume of water applied at each irrigation should be in the range of 10-gallons per inch of trunk diameter when measured at 54-inches above natural grade. The final decision of whether to water or not should be based on accurate soil probe samples that are taken from the root ball.

5.50 SOIL IMPROVEMENT

Required Practices

During development, compaction of the soil is the largest single factor responsible for the decline of oaks and older trees. Ninety percent of the damage to the upper eighteen inches of soil occurs during the first pass of heavy equipment - and cannot be reversed. Every effort to avoid compaction of soil porosity within the tree protection zone shall be taken at all times (*see Soil Compaction, Section 1.29*). When required by the conditions of *Discretionary Development Approval* for a project or as mitigation for injury or a prohibited action, the following performance standards for improvement of compacted or damaged soil shall be implemented:

A. Aeration

Required Practices

Soil that is damaged or compacted within the dripline of *protected* or *designated trees* shall be loosened or aerated to promote root growth and enhance tree vitality. One of the following aeration methods shall be specified an in effort to correct compacted soil conditions:

- *Vertical Mulching:* auger holes 2 to 4-inch diameter, 2 to 3-feet deep, on 4-foot centers and backfilled with porous material such as perlite, vermiculite or volcanic rock (*see Definitions, Section 1.41*)

notes:

- Radial Trenching: with an air excavator, excavate a soil trench 3 to 6-inches wide and a minimum of 12-inches deep from (approximately) 3-feet from the trunk out to the dripline area. The trenches shall radiate out from one foot apart at the closest point.
- *Soil-fracturing* with a pneumatic air-driven device (*see Definitions, Section 1.30*)
- Subsurface injections under moderate hydraulic pressure using a three foot probe and applied on 3-foot centers under the dripline

Required Practices

B. Drainage

Adequate drainage must be provided to the surrounding soil for the planting of new trees. If the trees are to be planted in impermeable or infertile soil, and water infiltration rates are less than 2-inches an hour, then one of the following drainage systems or other approved measures must be implemented (*see Drainage, Section 3.40-C)*.

- French drain, a minimum of three feet in depth
- Drain tiles or lines beneath the trees
- Auger six drain holes at the bottom perimeter of the planting pit, a minimum of 4-inches in diameter, 24-inches deep and filled with medium sand or fine gravel

5.60 INSECT AND DISEASE CONTROL

Generally, insect populations do not threaten tree health to the point of mortality. More often, when their populations become too great they create a nuisance. For example, scale on tulips or aphids feeding on purple leaf plums produce sticky honeydew that may be a nuisance if dripping on cars or at a storefront entry. Occasionally, however, pests such as Oak or Tussock Moth larvae can defoliate and severely damage a tree. If action is warranted, Integrated Pest Management (I.P.M.) suggests that the pest source be identified and targeted with a specific and timely treatment. If insects or disease can lead to the death of a *protected* or *designated tree*, then it is the responsibility of the property owner to evaluate the condition according to the following guidelines and treat the problem in a timely fashion to prevent further deterioration of the tree

Recommended Practices

A. Insects

For treatment, consult a pest control operator that is licensed by the California Department of Pesticide Regulation. Accurate timing is critical for success.

- Nontoxic materials should be used whenever possible to control leaf-chewing insects

Required Practices

B. Disease and Decay - above ground

Disease such as heart-rot decay that erodes the health or weakens the structure of a *protected* or *designated tree* may compromise the safety of people or property (*see Hazardous Tree Determination, Section 4.0*). It is the property owner's responsibility to correct a known hazardous condition in a timely fashion.

- Consult with a *certified arborist* for remedy possibilities, for example, pruning out infected branches, thinning, or the spray application of a chemical treatment.

C. Disease - below ground

Soilborne diseases, such as Oak Root Fungus (*Armillaria mellea*) or Root Rot (*Phytophthora sp.*), are present in Palo Alto soils. Often, a poor landscape design surrounding old trees encourages harmful, and often lethal diseases. The following conditions that favor a disease environment must be avoided.

notes:

Required Practices

- Conditions to avoid: Compacting of the soil within the tree's dripline, adding fill dirt, rototilling, trenching, removing soil from the tree root area, and excessive or regular watering on or near the tree trunk area and planting incompatible water-loving plants within the tree's dripline. Combined with poorly-drained soil, these factors often activate normally dormant fungi to become opportunistic and infect the tree to cause the decline and eventual death of the tree. This decline can be slow and may not be evident for many years.
- Landscape Design
  When planning landscaping around a *protected* or *designated tree*, an evaluation of the tree and soil must be performed to determine if there is a disease present. If the tree is diseased and landscaping will contribute to decline, permanent damage or render it hazardous, it is the obligation of the property owner to take reasonable measures to reduce or eliminate the conditions that may cause the decline of the protected or designated tree.
- To identify cultural conditions that may lead to diseases such as Oak Root Fungus, Verticillium, Phytophthora or other soilborne fungi, review the *Sunset Western Garden Book* or consult with a *Certified Arborist* (*see Certified Arborist, Section 1.4*).
- Use plants under oaks that have low to moderate water needs. Refer to a list of these plants (*see Plant List for Use Under Oaks, Appendix L*), *Sunset Western Garden Guide* or call Canopy: Trees For Palo Alto at (650) 964-6110.
- Plants selected for use under an oak should not need water more than once a month. Use a drip system to irrigate around an oak so that runoff does not flood the area.

D. Foliar disease

Leaf spot or galls may be chronic or reoccur with specific seasons. Though many of these diseases destroy leaf tissue and become unsightly, they may not significantly reduce the trees health and therefore need not be treated.

5.80 FRUIT CONTROL

Recommended Practices

While all trees produce flowers or fruit of some kind, some trees can be considered a nuisance if the use area is not compatible with the litter generated by the tree. For example, the dropping fruit of the European Olive (*Olea europaea*), American Sweet Gum (*Liquidamber styraciflua*), or acorn drip of a Holly Oak (*Quercus ilex*) may be a safety hazard if it is in the proximity of a handicap ramp or other high pedestrian area and will thus justify control measures. Control can only be successful if materials are applied carefully at optimum timing. For treatment to control the situation, consult a pest control operator that is licensed by the California Department of Pesticide Regulation.

notes:

5.90 FIRE PROTECTION: KEEPING THE OPEN SPACE, PARKS & COMMUNITY SAFE

Recommended Practices

The following measures are recommended but not required. If followed, they may help avoid a catastrophic and irreplaceable fire loss to persons, houses, hillsides and mature trees that are centuries old.

Checklist:

- ❑ Keep dry grass mowed below 6-inches.
- ❑ A 30-foot defensible space should be obtained.
- ❑ No vegetation growing or combustible storage under decking.
- ❑ No tree canopy within 10-feet of chimney spark arrester.
- ❑ Break up solid areas of continuous plant growth which create a 'fire-ladder'.
- ❑ Ask nursery professionals about fire-resistant shrubs to use in landscaping.
- ❑ Keep tree well watered, regularly pruned and in healthy condition.
- ❑ Prevent build-up of leaves and old branches.
- ❑ No firewood storage within 10-feet of structures.
- ❑ Make sure your driveway, road and bridges allow access for fire equipment (13-foot vehicle clearance needed).
- ❑ Homes adjacent to slopes over 30% will need additional clearing of vegetation from the structure 100-200 feet to protect against radiant and convective heat currents and flame reach.

5.95 TIPS FOR SELECTING AN ARBORIST

Recommended Practices

A. Who should you look for?

Hiring a tree care provider deserves careful consideration and caution. A mistake can be expensive and long-lasting, while the right choice can assure health, beauty and longer life for your trees and landscape. The following suggestions will help you select an arborist:

- Check the phone directory, usually under trees or tree care service. Listings in the directory should indicate some degree of permanence. Look for professional membership affiliations. Membership does not guarantee quality, but a lack of it may cast doubt on the company's commitment to professionalism.
- Beware of door-knockers. Most reputable companies have all the work they can handle without going door-to-door.
- Request that the sales person be an arborist or tree worker that has been certified through a program of the International Society of Arboriculture (ISA). This program is the standard of performance for appropriate training, experience and knowledge about tree care. Additionally, it is best to use an arborist who is familiar with the trees and ordinances of the City of Palo Alto.

- Require a certificate of insurance, including liability for personal injury and property damage (such as your house and your neighbor's), and workers compensation. Phone their insurance company to make certain each policy is current. Under some circumstances, the property owner may be held financially responsible if an uninsured worker is hurt on your property, or if damage is done to a neighbor's property!
- Ask for local references and other jobs the company or individual has done in Palo Alto. Experience, education and good reputation are signs of a good arborist.
- Have more than one arborist look at your job and give you a written estimate that clearly states their scope of work. Don't expect a company to lower its bid to match another's bid. Be willing to pay for the estimate if necessary. Two or more opinions and estimates are worth the extra effort.
- A good arborist will offer a wide range of services including removal, pruning, fertilizing, cabling, pest control, etc.
- A good arborist will not recommend topping (Section 1.32) except in rare circumstances (such as; crown restoration after severe physical or wind damage, or for a formal setting in a restricted space).
- A knowledgeable arborist will not use climbing spikes if the tree is to remain in the landscape. These should be used only for tree removal.
- Beware of an arborist who is eager to remove a living tree. Removal clearly should be a last resort.

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B. The Contract for Services

To be assured of having your work performed to the standards you expect, a contract should include all the necessary assurances. Most companies will provide their own contract and should include the following basics:

Recommended Practices

- Dates that work will begin and end.
- List exactly what will be done (*see Types of Pruning, Section 5.20*). If your tree is to be sprayed, get a written statement detailing the insect or disease to be treated, the chemical to be used and what precautions you need to take (cover patio furniture, keep pets inside, etc.). If fertilizer, how many pounds of fertilizer per inch of trunk diameter will be applied and by what method.
- Cleanup procedures should be listed and whether firewood will need to be cut (and into what lengths) should both be mentioned.
- Clarify if a tree removal includes grinding the stump and surface roots and if so, how deep?
- Will they remove grindings and backfill the hole?
- The total dollar amount you will be charged.
- Work is usually priced in one of two ways: (a) as a single price for the job, or (b) on an hourly basis plus materials. When using the latter, be sure to include the wording, "...but not to exceed...".

notes:

C. Using Arborists for Preventative Care

- A proactive tree and plant health care program can assure that minor, early pruning will prevent major, corrective pruning later on. An annual inspection will likely help you develop the landscape relatively hazard-free and display attractive curb appeal.
- Consulting arborists also offer advice and appraisals, diagnosis of problems and recommend treatment. They also can serve as a 'second opinion', if needed.

END OF SECTION

notes:

SECTION 6.00 TREE REPORTS

INTRODUCTION
An arborist report is needed for development projects and tree removal permits. The report must be prepared by a certified arborist for the applicant and submitted to the City for the purpose of providing accurate information and opinion regarding the condition, welfare, maintenance, preservation or value of a *protected or designated* tree.

Required Practices

A. When a written report is required

Generally, there are two circumstances in which tree reports are required: 1) when a tree removal permit is sought, and 2) to complete and verify a site plan, assess tree impacts and establish tree protection for property development when within the dripline of a *protected* or *designated tree*. Types of report formats are: *Letter Report, Tree Survey, Tree Protection and Preservation Plan* and *Tree Appraisal*.

B. Who may prepare the report

The tree report is to be prepared by a certified arborist retained by the applicant or property owner. This person shall possess a current ISA certification (*see Certified Arborist, Section 1.00*); be a member of the American Society of Consulting Arborists; or a member of good standing in another nationally recognized tree research, care, and preservation organization.

6.05 REPORT FOR INDIVIDUAL TREE REMOVAL PERMIT

Required Practices

A. Tree Removal Permit

The procedure (*see Tree Removal Checklist, Appendix M and Removal of Regulated Trees, Section 3.05*) involves three steps which must be completed and approved to *remove a protected tree*. The information contained within the application will be reviewed by the City Arborist for written response within aproxiamately 10 working days.

B. Submittals

For this purpose, the following information is to be submitted to the City for review:

- A completed application for the protected tree removal (delivered to the City of Palo Alto, Development Center, 285 Hamilton Avenue, Palo Alto, CA 94301)
- A filing fee ($145) for review and records management. (FY Fee Schedule Application fee - $125, records management $20)
- An arborist report prepared by a certified arborist

C. Written authorization

To *remove* a publicly-owned tree (*street tree*), the property owner shall first have obtained written permission from Public Works Operations or City Arborist. For a *protected tree* on private property, the permit from the Planning Division must be on site when the tree is being removed. For a *designated tree* in property development, the approved plans serve as the approval and no separate written permit is needed.

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Required Practices

6.10 TYPE OF REPORT: LETTER FORMAT

A. Letter Report

A brief format is acceptable for (1) and (2) below, and can generally be used for assessing one or two trees. The report is to be on letterhead stationery of the individual preparing the report, including their ISA Certification number.

1. Removal
   If for a tree *removal* (i.e., an application request for a single tree removal only, not in connection with a property development), the report shall provide information and determination whether the tree is dead, hazardous or constitutes a nuisance under PAMC Section 8.04.050 (2).

2. Development
   If for development on a single family residential lot (not a subdivision), the report shall also clearly indicate whether or not any *protected* or *designated tree* is so close to the 'building area or building footprint' that it will be killed or permanently injured by disturbance. The report must make specific recommendations to protect and preserve the tree during the course of construction that are consistent with the specifications within this *Manual (see Tree Protection & Presentation Report, Section 6.30)*.

Required Practices

6.15 LETTER REPORT - SUBMITTALS

A. Standard information

All letter reports shall contain the following information: Arborist name and certification number; purpose of the report and for whom; site address; date of the inspection(s); a to-scale diagram of the tree(s) location, accurate size of the trunk diameter (measurement taken at 54-inches above natural grade); perimeter of leaf canopy; proximity to structures; condition of the tree health (and/or decay presence), condition of the tree structure, imminent danger of failing (ISA Hazard Rating, *see appendix C*); interface with utility services; conclusion and recommendation(s), photographs (encouraged) and Tree Protection Instructions (if needed).

B. Specific situations

Other conditions may require the following additional information on an as-needed basis if requested by the reviewing City staff: tree protection plans; appraised value (*see Tree Appraisal, Section 6.40 below*); and any other supporting information, photographs, diagrams, etc. that may be necessary.

Required Practices

6.20 TYPE OF REPORT: TREE SURVEY FORMAT

A more extensive 'Tree Survey Report' is required for all development projects except those identified in Section 6.10 above. The report shall inventory all trees that are greater than 4-inches in diameter (measured at 12-inches above natural grade) on site, including trees to be removed, relocated and retained on the property (including trees on neighboring properties that overhang the project site) and all *street trees* in the right-of-way within 30-feet of the project site (*see Tree Disclosure Statement, Appendix I*). In addition to information required in a letter report, the Tree Survey Report, shall include an inventory of the trees, site plan, appraised value (*see Appraisals, Section 6.40 below*) of the trees and any other information pertinent to the project.

6.25 SURVEY REPORT - SUBMITTALS

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Required Practices

A. Items to include

All Tree Survey Reports shall contain the following information: Arborist name and certification number; cover letter; title page; table of contents (if necessary); purpose of the report and for whom; site address; date of the inspection(s); site plan (showing each tree location by number that correlates with the tree inventory on plans; tree inventory data (include tree species, size, health, structure, etc. for all trees on the project site, including those to be removed (tables may be used); condition of the trees (include information with respect to health, structure, decay, imminent danger of falling, existing property lines, structures and utility services) conclusion, recommendation(s) and rated for suitability for preservation. The report shall include a separate list of all *protected trees* with location numbers. If necessary, other supporting information, photographs, diagrams, etc. may be required or provided.

B. Appraised Value

The monetary value that each tree contributes to the real estate value of the property shall be determined and listed separately within the Tree Survey Report. The formula used should be noted (*see Tree Appraisal, Section 6.40 below*).

6.30 TREE PROTECTION AND PRESERVATION REPORT

Required Practices

All *protected* or *designated trees* to be retained on a development site shall be shown on approved sets of civil, building and landscape plans and shall be protected during the construction process. *A Tree Protection and Preservation Plan* submitted for review by the Planning Division is required when trees to be saved may be *injured* by *disturbance*. The tree preservation plan shall assume compliance with standards in Section 2.00 of this *Manual* (*see Protection of Trees During Construction, Section 2.00*). In addition, the following submittal information must be included in the report:

A. Scope & Construction Phasing

The *tree protection and preservation plan* shall identify, but not be limited to, written recommendations for the health and long-term welfare of trees that are to be followed during the following distinct phases and conditions: pre-construction; during construction, post construction, demolition activities; methods of avoiding injury, damage treatment and inspections. Schedules shall be included.

B. Tree Protection Zone

The *tree protection and preservation plan* shall establish a tree protection zone (TPZ) for each tree to be fenced and clearly outline site-specific measures for protection of the trees during construction and describe a plan for continued maintenance of those trees after construction. After project approval, any changes to the protection measures must be approved in writing, by the *City Arborist*. The tree protection plan shall include the following *site plan* elements:

notes:

6.35 SITE PLAN

Required Practices

A. Disclosure of all trees on and near the site

The property owner or designee shall provide accurate information to the project arborist to develop the tree protection measures and to enable accurate recommendations to insure their survival. This *site plan* shall accurately show the surveyed location, species, size of trunk and leaf canopy; show the dripline of any neighboring trees that may overhang the site and *street trees* that are within 30-feet on each side of the project (*see Tree Disclosure Statement, Appendix I*). Failure to show a tree on the plans and later determined to be affected by construction may require the work to stop until mitigation can be agreed upon by the property owner and the City.

B. Plans submitted to the City

In addition to the above information, final improvement plans shall include and show the following information: show the *tree protection zone* of any tree to be retained and denote a 5-foot chain link type fencing around the protected zone of each tree or group of trees (to be clearly identified as such on all plans as a bold-dashed line); permeable paving located within the dripline area; approved utility pathways; grade changes; surface and subsurface drainage and aeration systems to be used; walls, tree wells, retaining walls and grade change barriers, both temporary and permanent; landscaping and irrigation within dripline of trees.

C. Plans must show tree protection

Protective tree fencing identified within the arborist report, both written and diagrammatic, shall be clearly shown as a bold, dashed line on the approved site plans submitted for demolition, grading, construction, building permit or any other aspects that are relevant to the project.

6.40 TREE APPRAISAL

Required Practices

Landscape value may contribute from seven to 20-percent of the real estate property value. An individual tree has an inherent value to the real estate that can be determined by an appraisal prepared by a certified arborist. An appraisal is a process for determining a monetary opinion of the value of a tree as it relates to either the property, a group of trees and/or the immediate community. A qualified *certified arborist* is required to determine this value, and must exercise good and fair judgement by adjusting the basic value by the tree's condition and location. There are two methods to determine tree value; (1) the Replacement Method, based upon the size and availability of the replacement tree or, (2) the Trunk Formula Method, if the tree cannot be replaced (e.g. not sufficient room on site or it is too large to replace). In all cases, the type of formula used must be identified.

6.45 APPRAISAL METHODS

Required Practices

The certified arborist must prepare the appraisal by using the most current edition of (1) the *'Guide for Plant Appraisal'*, published by the Council of Tree and Landscape Appraisers, and (2) the most recent *'Form for Northern California'* established by the International Society of Arboriculture.

A. The Replacement Cost Method

Applies to smaller trees with a trunk size up to 4-inches in diameter or, 48-inch box size trees (replaceable.) For this method, the appraised value shall be determined by combining: price quote + transportation + planting + other costs and applying the condition and location value to the tree. The sum of these is the appraised replacement cost.

B. The Trunk Formula Method

Applies to trees that are too large for practical replacement (transplanting) and shall be appraised by: determining the basic tree value and adjusting this value by a condition and location ratings. The appraised value shall be determined by using the most recent edition of the *'Guide for Plant Appraisal',* published by the Council of Tree and Landscape Appraisers. The Trunk Formula or Replacement Method Forms for Northern California established by the International Society of Arboriculture must be used to compute the appraised value. All trees with a stem larger than 4-inches in diameter when measured at 12-inches above natural grade shall be calculated in this manner. (*See Determining the tree value, Section 3.25*).

notes:

END OF SECTION

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