

Section 32 01 93
Tree and Plant Protection

PART 1 - General

1.1 Description

- A. The work in this Section consists of:
 - i. Protection of existing trees, landscaping and irrigation systems to remain, and maintenance of the existing trees and plants in healthy growing condition.
 - ii. Restoration and repair of all existing trees, landscaping, and irrigation systems damaged as result of the Contractor's work, activities, equipment, materials and personnel.

1.2 Related Work

- A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
- B. Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROL
- C. Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT
- D. Section 02 41 00, DEMOLITION
- E. Division 31, Earthwork
- F. Division 32, Exterior Improvements

1.3 DEFINITIONS

- A. Certified Arborist: An arborist certified by the International Society of Arboriculture (ISA). The tree care and maintenance work specified in this Section shall be performed by or under the supervision of a Certified Arborist. The Certified Arborist shall be supplied at the expense of the Contractor
- B. Project Arborist: An arborist certified by the International Society of Arboriculture (ISA), who is responsible for assessing the existing trees and their needs, and supervising the implementation of the tree protection measures, mitigations and maintenance work for this Project. The Project Arborist shall be supplied at the expense of the Contractor.
- C. Drip Line: The outer edge of the tree canopy.
- D. Existing Tree: Any tree growing on the VA property and not planted under this contract.
- E. Injury: Is without limitations, any bruising, scarring, tearing, or breaking of roots, branches, or trunk of a tree, or direct effects of heat, drought, chemicals, and root compaction.
- F. Tree Protection Zone: The Tree Protection Zone is defined for each species. Species tolerance to construction impacts and the tree's age determine the radius of the Tree Protection Zone. The Tree Protection Zone shall be defined by the Project Arborist or the Contracting Officer's Representative, or a distance of one-foot radial distance from the trunk for each one-inch of trunk diameter

BUILDING T6B RENOVATION

3801 MIRANDA AVE

PALO ALTO, CA 94304

measured at 54 inches above nature grade and/or to the drip line of the tree, whichever is the greater distance.

1.4 REFERENCE, CODES AND STANDARDS

- A. The Contractor shall comply with all Federal, state and local standards and regulations, as well as Organization of Safety Health Agency (OSHA) and Environmental Protection Agency (EPA) regulations, throughout the duration of the Project.
- B. The Contractor shall procure all permits, licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the provisions of services.
- C. All tree work shall be in accordance with contract specifications and the latest edition of the following:
 - i. Natural pruning guidelines from U.C. Extension publications
 - ii. Arboriculture by Harris, Matheny & Clark
 - iii. National Arborist Association Standards and other industry standard publications, including:
 - a. ANSI A300 - Standard Practices for Tree Care Operations, including referenced Combined Federal Regulations (Utility Pruning and Emergency Service Restoration)
 - b. ANSI Z133.1 - Safety Requirements for Arboricultural Operations
 - iv. International Society of Arboriculture, Best Management Practices (BMP)

1.5 Quality Assurance

- A. The Contractor shall be directly responsible for protection and welfare of all existing trees within the Project site that are noted to remain, and all existing trees outside of the Project site which may be damaged by the Contractor's work, activities, equipment, materials and personnel. This responsibility shall continue until the entire Project is completed and accepted by the VA and through maintenance period.
- B. All tree care and maintenance work shall be performed by or under the supervision of a Certified Arborist (Arborist).
- C. Only recognized and approved methods, techniques and standards for tree care shall be used. All tree work shall be performed in accordance with the contract specifications and the standards and publications per Article 1.4.C.
- D. Pre-construction Conference: Conduct conference at the Project site with Contracting Officer's Representative.

1.6 Submittals

- A. Submit in accordance with Section 01 33 23, Shop Drawing, Product Data, and Samples.
- B. Submit Qualification Data for approval before work is started:
 - i. ISA certification of Certified Arborist who will be performing or supervising the tree removal and protection.

BUILDING T6B RENOVATION

3801 MIRANDA AVE

PALO ALTO, CA 94304

- C. If pesticides and chemicals are to be used, submit the labels, and Material Safety Data Sheets (MSDS) of pesticide and chemicals, and a copy of their license authorizing the Contractor to apply pesticide and chemicals to maintain a healthy planting. The pesticides and chemicals must be approved prior to their use on the VA property.

1.7 Maintenance Period

- A. The maintenance period for the existing trees and plants shall be concurrent with the landscape maintenance period for the new planting and irrigation system of the Project. If the Project does not include a landscape maintenance period, then the maintenance period for the existing trees and plants shall be through the date of the Project's Final Acceptance.
- B. Maintenance shall be performed in accordance with Article 3.14 of this Section.

1.8 Repairs

- A. Any damage to existing tree trunks, or to limbs or roots over 2-inch in diameter shall be immediately reported in writing to the Contracting Officer's Representative, and at the direction of the Contracting Officer's Representative, repaired immediately by the Contractor.
- B. The Arborist shall direct repair and any necessary maintenance treatments of trees damaged by construction operations. Repairs shall be made promptly after damage occurs to prevent progressive deterioration of damaged trees.
- C. Do not remove damaged tree limbs or trees which have died as a result of injury without the written permission of the Contracting Officer's Representative.
- D. Repair shrubs, turf and other plant materials damaged by the Contractor's work in a manner acceptable to the Contracting Officer's Representative.
 - i. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged plant. Remove and replace all dead and damaged plant up to six inches diameter that are determined by the Contracting Officer's Representative as being incapable of restoration to normal growth pattern.
- E. Repair or replace damaged irrigation components and/or systems to the satisfaction of the Contracting Officer's Representative where damage is attributable to the Contractor's work. Cost of repairs or replacements shall be at Contractor's expense.

PART 2 - PRODUCTS

2.1 Tree Protection Fencing

- A. Mesh construction fencing, 5 to 6 feet high, orange color. Mount mesh fabric on galvanized steel or iron posts, driven to the ground to a depth of at least 2 feet at no more than 10 feet on center. Secure mesh fabric to posts with #14 gauge wires.

BUILDING T6B RENOVATION

3801 MIRANDA AVE

PALO ALTO, CA 94304

2.2 Organic Mulch (Wood Chips)

- A. Fir tree or pine tree bark mulch, natural color, 1 to 2 inch in size.

2.3 Accessory Materials

- A. As determined by the Contactor as necessary for sustaining the health of the trees and plants, subject to acceptance by Contracting Officer's Representative. Accessory materials may include tree and plant stakes, temporary barriers, temporary irrigation and covers.

PART 3 - EXECUTION**3.1 Preparation**

- A. The Contractor shall comply with all applicable laws, codes and regulation required by authorities having jurisdiction over the work. The Contractor shall immediately notify the Contracting Officer's Representative in writing where the Contract Documents or instructions conflict with applicable laws, codes and regulations. Do not proceed with affected work without written directions from the Contracting Officer's Representative.
- B. The Contractor shall become acquainted with all site conditions and take necessary precautions to protect the site conditions and improvements to remain. Damage caused by the Contractor shall be repaired to its original conditions or equal replacement shall be done to the satisfaction of the Contracting Officer's Representative. Should utilities, grade changes, or other conditions not shown on the Contract Documents be found within the Tree Protection Zone during the course of the Project, report to the Contracting Officer's Representative in writing, and obtain instructions prior to proceeding with the work affected.
- C. The Contractor shall field verify all dimensions, grades, and coordinates, which affect existing trees and plants. Report discrepancies to the Contracting Officer's Representative in writing, and obtain instructions prior to proceeding with the work affected.

3.2 Pre-construction Conference

- A. It shall be the responsibility of the Contractor to call for a meeting at the Project site with the Contracting Officer's Representative. Meeting attendees shall include the Contractor, Contracting Officer's Representative. The meeting shall occur prior to the start of construction of any nature within the protection zone of the trees.
- B. The purpose of the meeting shall be to:
 - i. Confirm the limits of the protection zone of all existing trees to remain
 - ii. Confirm what work is to occur near the trees and discuss mitigation of the potential impacts on the trees to be preserved if necessary.

BUILDING T6B RENOVATION

3801 MIRANDA AVE

PALO ALTO, CA 94304

3.3 TREE PROTECTION FENCING

- A. Tree protection fencing shall be erected and approved by the Contracting Officer's Representative, at least 24 hours before the start of construction.
- B. Fencing at a height of 5 or 6 feet shall be installed either at the edge of the Tree Protection Zone or at the edge of the construction zone if the construction protrudes into the Tree Protection Zone.
- C. The Contractor shall maintain the tree protection fencing and prohibit all access into the fenced areas by construction personnel and equipment. All fencing shall remain until Project completion, and it shall then be removed only as directed by the Contracting Officer's Representative.
- D. During the course of construction, Contractor shall relocate the fence if required to facilitate construction only after notifying the Contracting Officer's Representative, to avoid compaction or other injury of tree roots.
- E. The Contractor shall protect the fencing and be responsible for any damage incurred to the fence requiring replacement or reinstallation.
- F. Activities prohibited in the fenced area are described in Article 3.4.C of this Section.

3.4 TREE PROTECTION

- A. Take all necessary precautions to protect the existing trees to remain against damage from construction operations. Protection shall be given to the roots, trunk, limbs and foliage of all existing trees, and the soil within the Tree Protection Zone of the tree.
- B. Approval by the Contracting Officer's Representative to work within the Tree Protection Zone shall not waive the Contractor's responsibility for complying with the requirements of this Section. Special protection to prevent compaction of tree roots or other damages shall be implemented.
- C. The following activities are NOT permitted within the Tree Protection Zone of an existing tree, except as otherwise specified in this Section.
 - i. Construction traffic - heavy equipment, vehicles, construction personnel
 - ii. Parking of vehicles
 - iii. Storage of construction equipment, building materials, refuse, and excavated materials.
 - iv. Skinning and bruising of bark.
 - v. Use of tree as temporary support post, power pole, or signpost; anchorage for ropes, guy wires or power lines or other similar functions.
 - vi. Dumping of poisonous or hazardous materials on and around trees and roots. Such materials include, but are not limited to, paint, petroleum products, concrete or stucco

BUILDING T6B RENOVATION

3801 MIRANDA AVE

PALO ALTO, CA 94304

- mix, contaminated water, herbicides and other materials that may be harmful to tree health.
 - vii. Cutting of tree roots by utility trenching, foundation digging, placement of curbs and trenches, and other miscellaneous excavation without prior written approve by the Contracting Officer's Representative.
 - viii. Damage to trunk, limbs, or foliage caused by maneuvering vehicles or storing material or equipment too close to the tree.
 - ix. Compaction of the root area by movement of trucks, equipment outriggers, or grading machines, storage of equipment, materials or tools; stockpiling or gravel or soil; or erection of temporary structures.
 - x. Excessive water or heat from equipment or construction under or near shrubs or trees.
 - xi. Alternation of existing site surface drainage patterns within the area of the drip line, except as shown on the Contract Documents or as approved in writing by the Contracting Officer's Representative.
 - xii. Use of herbicide, within the Tree Protection Zone, without prior written approval by the Contracting Officer's Representative.
- D. All necessary measures shall be taken to maintain healthy living conditions for existing trees to be preserved. Such measures are permitted or required in the Tree Protection Zone and shall include, but not limited to, the following.
- i. Dust Control. During periods of extended drought, wind or grading, spray wash trunk, limbs and foliage to remove accumulated construction dust and other detrimental materials.
 - ii. Mulching. During construction, wood chips shall be spread within the Tree Protection Zone 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.
 - iii. Root buffer. When areas under the tree canopy cannot be fenced, a temporary buffer of mulch, gravel and plywood is required and shall cover the root zone and remain in place at the specified thickness until final grading stage.
 - iv. Irrigation. Irrigate trees as necessary to maintain their health before, during and after the construction work under the Contract, as directed by the Arborist.
 - a. Irrigate to wet the soil within the Tree Protection Zone to a depth of 24 to 30 inches. The soil should not be oversaturated.

BUILDING T6B RENOVATION

3801 MIRANDA AVE

PALO ALTO, CA 94304

- b. Duration of irrigation shall be until Project completion and through the post-construction maintenance period. Quantities and lengths of watering time are variable and shall depend upon seasonal rainfall. Irrigation recommendations shall be specified by the Project Arborist.
 - c. If the soil within the Tree Protection Zone of the tree is compacted, then prior to watering or fertilizing trees, rototill the area within the Tree Protection Zone of the tree to loosely break up the top two (2) inches of existing soil.
- E. If a tree is adjacent to or in the immediate proximity to a grade slope of 8% (23 degrees) or more, approved erosion control or silt barriers shall be install outside the Tree Protection Zone to prevent siltation and/or erosion within the zone.

3.5 Demolition and Site Clearing

- A. The Contracting Officer's Representative shall review any tree removal work within 50 feet of a Tree Protection Zone. The removal of trees adjacent to protected trees shall follow the following tree removal practices.
 - i. Tree Removal. Removal of trees that extend into the branches or roots of protected trees shall not be attempted by demolition or construction personnel, grading or other heavy equipment. A Certified Arborist shall perform the work or supervise the removal by qualified tree worker. The tree shall be removed carefully in a manner that causes no damage above or below ground to the trees that remain. Excavation equipment shall operate from outside the Tree Protection Zone.
 - ii. Stump Removal. Before performing stump extraction, the Contractor shall determine whether or not roots may be entangled with the trees that are to remain. If so, these stumps shall have their roots severed before extracting the stump.
 - a. Removal shall include the grinding of stumps and roots to a minimum depth of 18 inches, exposing the soil beneath stump to provide drainage. If dug below 30 inches, compact the backfill to prevent settling.
 - b. Large surface roots that are 3 feet from the outside circumference shall be removed, including the spoils, and backfilled with approved topsoil to grade. The area shall be tamped to settle the soil.
- B. Removal of existing pavement over tree roots in the Tree Protection Zone shall include the following precautions.
 - i. Break hardscape into manageable pieces with a jackhammer or pick, and hand load the pieces onto a loader. The loader must remain on undisturbed pavements or off exposed roots.

BUILDING T6B RENOVATION

3801 MIRANDA AVE

PALO ALTO, CA 94304

- ii. Do not remove based rock that has been exploited by established absorbing roots.
 - iii. Apply wood chips over the exposed areas within one hour, then wet the chips and base rock, and keep moist until overlay surface is applied.
- C. Excavation equipment shall operate from the outside of the Tree Protection Zone.
- D. All shrub and groundcover removal should be performed with hand equipment when within a Tree Protection Zone.

3.6 Grading Limitation within the Tree Protection Zone

- A. Grade changes outside of the Tree Protection Zone shall not significantly alter drainage to the tree.
- B. Grade changes within the Tree Protection Zone are not permitted, except as shown on the Contract Documents or as approved in writing by the Contracting Officer's Representative.
- C. 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 otherwise mitigated.

3.7 Trenching and Excavation within the Tree Protection Zone

- A. Trenching and excavation shall not occur within the Tree Protection Zone without the written approval of the Contracting Officer's Representative. Excavation within the drip line of trees for new utilities may occur only when there is no other alternative for realignment or relocation of the utilities, and only with the Contracting Officer's Representative's written approval.
- B. Roots Severance
- i. Roots 2 inches or greater shall remain injury free. Smaller roots that interfere with installation of new work may be cut.
 - ii. Any roots 1 inch in diameter or larger requiring removal shall be cut cleanly to sound tissue. Tree roots shall be cut with a saw or tooth grinding wheel rather than broken as in typical backhoe trenching, to minimize root wrenching.
 - iii. Moisten roots and surrounding soil and cover with a 4 to 6 inches mulch layer to prevent desiccation.
 - iv. Cut and exposed roots shall not be allowed to dry out before permanent backfill is placed.
 - a. Temporary earth cover shall be provided or roots shall be placed with wet peat moss or four layers of wet untreated burlap, and temporary supported and protected from damage until permanently covered with back fill.
 - b. The cover over the roots shall be wetted to the point of saturation runoff daily.
- C. Excavation

BUILDING T6B RENOVATION

3801 MIRANDA AVE

PALO ALTO, CA 94304

- i. Any approved excavation, demolition or extraction of materials shall be performed with equipment sitting outside of the Tree Protection Zone.
- ii. Methods permitted are by hand digging, hydraulic or pneumatic air excavation technology.
- iii. If excavation or trenching for utilities, drainage and irrigation lines, it is the responsibility of the Contractor to tunnel under any roots that are 2 inches in diameter or greater.
- iv. Prior to excavation, grading or trenching within the Tree Protection Zone, cleanly sever the roots that are 1 foot outside the Tree Protection Zone to the depth of the future excavation. The trench must be hand dug and roots pruned with a saw, sawzall, narrow trencher with sharp blades or other approved root pruning equipment.

D. Tunneling and Directional Drilling

- i. Approved trenching or pipe installation within the Tree Protection Zone shall be either cut by hand, air-spade, hydraulic vac-on excavation or by mechanically boring the tunneling under the roots with a horizontal directional drill or hydraulic or pneumatic air excavation technology. In all cases, install utility pipe immediately, backfill with soil and soak within the same day.
- ii. Recommended trenching or boring distances are as follows.

Tree Diameter Measured at 54 Inches Above Grade	Minimum Distance for Trench / Boring from face of Trunk in Any Distance
9 inches or less	6 to 9 feet
10 to 14 inches	10 to 14 feet
15 to 19 inches	15 to 19 feet
Greater than 19 inches	20 feet +

- iii. Recommended depths of tunneling are as follows.

Tree Diameter Measured at 54 Inches Above Grade	Depth of Tunneling
9 inches or less	2.5 feet
10 to 14 inches	3.0 feet
15 to 19 inches	3.5 feet
Greater than 19 inches	4.0 feet

E. Backfilling

- i. Approved excavations shall be carefully backfilled with uncontaminated soil approved the Contracting Officer's Representative for backfilling at each location.
- ii. Backfill shall conform to adjacent grades without dips, sunken areas, humps, or other surface irregularities.
- iii. Jet backfill when trench has been backfilled to half its depth and again when fully backfilled, making certain no air pockets exist around the roots.

BUILDING T6B RENOVATION

3801 MIRANDA AVE

PALO ALTO, CA 94304

- iv. Tamp backfill carefully using hand tools. Refill and re-tamp as necessary to offset settlement. Do not use mechanical equipment to compact backfill.

3.8 Heavy Equipment

- A. Use of backhoes, steel tread tractors or any heavy vehicles within the Tree Protection Zone is prohibited, unless approved by the Contracting Officer's Representative.
- B. If such activities are allowed, a protective buffer shall be installed by the Contractor.
 - i. The protective buffer shall consist of a base course of 2 inch wood chips, spread over the root area to a minimum of 6 inch depth, layered by $\frac{3}{4}$ inch quarry gravel to stabilize $\frac{3}{4}$ inch thick plywood sheets on top.
 - ii. The protection buffer within the Tree Protection Zone shall be maintained through the entire construction process.

3.9 Soil Compaction Mitigation

- A. If inadvertent compaction of the upper 12 inch of soil horizon within the Tree Protection Zone has occurred within the Tree Protection Zone, the soil shall be loosened by one or more of the following methods to promote favorable root conditions: vertical mulching, radial trenching, soil fracturing or other methods recommended by the Arborist and approved by the Contracting Officer's Representative.
 - i. Vertical Mulching. Auger holes 2 to 4 inch diameter, 2 to 3 feet deep, on 4 foot centers, and backfilled with porous materials such as perlite, vermiculite or volcanic rock.
 - ii. Radial Trenching. Excavate with an air excavator, 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 drip line area. The trenches shall radiate out from one foot apart at the closest point.
 - iii. Soil Fracturing. Loosen soil in the Tree Protection Zone with a pneumatic air-driven device.

3.10 Cutting and Trimming

- A. No trees shall be cut or fell without the written permission of the Contracting Officer's Representative. Trees which are cut without the Contracting Officer's Representative's permission or are damaged shall be repaired or replaced with comparable material at the Contractor's expense per Article 1.8 of this Section.
- B. The Certified Arborist shall identify and direct the removal of branches from trees and large shrubs where necessary to accommodate new construction or access to the Project site.
- C. The Certified Arborist shall identify and direct correctional pruning and cabling of trees, if required to clear new construction, and tree root pruning work.

BUILDING T6B RENOVATION

3801 MIRANDA AVE

PALO ALTO, CA 94304

- D. The cutting and pruning of existing trees to remain shall be performed according to the Certified Arborist's written instructions and with written approval by Contracting Officer's Representative.
- E. A Certified Arborist shall supervise or perform the pruning and tree work.
- F. The Contractor shall remove from the VA property all dead and damaged trees, as determined by the Contracting Officer's Representative, that are incapable of restoration to normal growth pattern.

3.11 Damage to Trees

- A. Any damage or injury to trees shall be reported within 6 hours to the Contracting Officer's Representative so that mitigation can take place. These include mechanical or chemical injury to branches, trunk or to roots over 2 inches in diameter.
- B. In the event of injury, the following measures shall apply:
 - i. 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 immediately be protected from drying. All exposed root area shall be backfilled or covered within one hour.
 - ii. Bark or Trunk Wounding. Current bark tracing and treatment methods shall be performed by a qualified tree care specialist within 2 days.
 - iii. Scaffold Branch or Leaf Canopy Injury. Remove broken or torn branches back to an appropriate branch capable of resuming terminal growth within 5 days. Tree limb pruning shall be performed by a qualified tree care specialist

3.12 Landscape Protection

- A. Protect and avoid damage to shrubs, groundcover, turf and other plant materials that are to remain. The Contractor shall restore damaged shrubs, turf, and other plant materials to original condition per Article 1.8 of this Section.
- B. Take necessary precautions to protect existing irrigation systems. Contractor shall repair or replace damaged irrigation systems or components to original condition per Article 1.8 of this Section.

3.13 Clean Up

- A. Clear all areas of debris and spoil piles.
- B. Remove all debris, rubbish and excess materials from the VA property when the work of this Section has been completed or at such other times as may be directed by the Contracting Officer's Representative.

3.14 Maintenance Period

- A. The maintenance period for the existing trees and plants shall be concurrent with the landscape maintenance period for the new planting and irrigation system of the Project. If the Project does not have a landscape maintenance period, then the maintenance period

BUILDING T6B RENOVATION

3801 MIRANDA AVE

PALO ALTO, CA 94304

for the existing trees and plants shall be through the date of the Project Final Acceptance.

B. During the maintenance period, the Contractor shall:

- i. Continue the necessary measures to maintain healthy living conditions for the existing trees in accordance with Article 3.4.D of this Section. Performed the additional measures as directed by the Contracting Officer's Representative.
- ii. Complete the required mitigation measures addressing soil compaction and tree injuries in accordance with Articles 3.9 and 3.11 of this Section. Perform the additional measures as directed by the Contracting Officer's Representative.
- iii. Perform pruning, trimming and thinning as needed to improve the health and structure of the existing trees per the directions of the Arborist.

C. At the end of the maintenance period, the Contractor shall schedule a final review with the Contracting Officer's Representative for the acceptance of the Project

- i. The Contractor shall be responsible for notifying the Contracting Officer's Representative 48 hours in advance for the review at the end of the maintenance period.
- ii. If the mitigation and pruning work is incomplete, continue tree maintenance, at no additional cost to the VA, until all work has been completed.

END OF SECTION