SECTION 01 56 39

TREE AND PLANT PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. As a condition of project approval, all trees within the project limit including lay down or staging areas shall be inventoried and evaluated by the Landscape Architect and/or Stanford Grounds Services Certified Arborist (SGSCA) for saving in place, relocating to other areas, or demolition.
B. All existing trees, shrubs and groundcovers to remain shall be indicated on the drawings. Removal of trees to be relocated shall be scheduled for completion before construction begins to avoid damage to trees, or trees shall be protected in place according to the following guidelines until transplanting is optimal.
C. The project shall be responsible for the health of transplanted trees for at least a 90 day period after transplant, or for a longer period of time as decided during design development with input and approval from an SGSCA.
D. Contractor to protect and insure welfare of all existing trees, shrubs and groundcover to remain or to be relocated, both within the contract limits, and within all adjacent areas used for access to construction site. Contractor to furnish and supply all equipment and personnel necessary for continued protection of tree and planting areas. Scope to include pruning, protection from physical damage including soil compaction in a tree's *root zone* (see 1.3 B), pest and disease control, and irrigation management during site work and construction.
E. All tree, shrub and plant pruning and irrigation scheduling to be supervised by an SGSCA (see 1.3 D).
F. Rare, threatened, endangered, or thought to be extinct California native vegetation as determined by Stanford University Campus Planning and Design Office and Grounds Services Department shall be retained and protected.
G. Normally existing California native vegetation including native oaks shall be retained and protected or relocated where possible.

1.2 RELATED WORK

Campus Planning & Design Office Landscape Guidelines: See
http://lbre.stanford.edu/architect/

FDG General Design Documents:
Landscape Design Guidelines

FDG Specifications Guidelines:
Section 31 10 00 Site Preparation
Section 31 20 00 Earthwork
Section 32 84 00 Irrigation
Section 32 90 00 Planting

Section 32 01 00 Site Restoration and Rehabilitation

FDG Drawings:
Irrigation Drawings IR-01 –IR-28
Planting Details PL-01 –PL-06

1.3 DEFINITIONS

A. "Injury" is defined, without limitation, as any burning, singeing, bruising, scarring, tearing, or breaking of foliage, roots, branches, or trunk.

B. "*Root zone*" is defined as the area from the trunk out to 10 feet beyond the outermost limits of the tree canopy.

C. "Landscape Architect (LA)" is **either** a licensed Landscape Architect **of the Stanford Campus Planning and Design Office** or a representative as designated by **that office**.

D. "Stanford Grounds Services Certified Arborist (SGSCA)" A Stanford Grounds Services Certified Arborist or representative as designated by a SCSCA. A Certified Arborist is defined as a person who has obtained an arborist certification from the International Society of Arboriculture.

E. "Owner" is defined as Stanford University. Owner Representative (OR) is a representative designated by Stanford University.

F. "International Society of Arboriculture (ISA)" is the organization that sets arboricultural guidelines, which often influence the ANSI regulations. This organization also is responsible for the training, education and certification of arborists.

G. "DBH" is defined as the measurement of the diameter of a tree trunk measured at breast ~~standard~~ height (4.5 feet from ground).

1.4 QUALITY ASSURANCE

A. General Responsibility: The Contractor shall be directly responsible for protection and welfare of existing trees, shrubs and groundcovers within and around the Contract Limits which are noted to remain. This responsibility shall continue throughout the full construction period until the entire Project is completed and accepted by the Owner and <u>through completion of the warranty period of one year for trees and shrubs</u> and shall include but not be limited to providing all barricades as required, watering/irrigation where necessary and providing protection from mechanical damage, soil compaction, pollution from all sources, and

disruption of environmental support which would result in the loss of vigor of said plantings. Contractor shall not take any action leading to the foreseeable death or permanent damage to a tree's health, including but not limited to excessive pruning, *root zone* soil compaction, cutting, girdling, poisoning, over watering, unauthorized relocation or transportation of a tree, or machine trenching, excavating, altering the grade, or paving within the *root zone* of a tree. Exceptions deemed necessary shall be done under the guidance and review of an SGSCA to minimize negative impacts to the health of the tree.

B. Qualifications of Tree Workmen: Trimming shall be supervised by a Stanford Grounds Services Certified Arborist. Not more than 1/4 of the foliage of a tree shall be removed in a 12 month period, except in the case of impending danger or hazardous condition. Provide an SGSCA who shall be present at all times during tree protection and trimming operations, who shall be thoroughly familiar with the type of work involved, and who shall direct all protection and trimming work.

1.5 Reference Standards: Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work of this Section.

A. International Society of Arboriculture (ISA) *Guide for Plant Appraisal, 9th edition,* prepared by the Council of Tree and Landscape Appraisers (CTLA), ISBN # 1-881956-25-3.

B. International Society of Arboriculture (ISA) Best Management Practices Series. These are booklets bundled with ANSI 300 Guidelines:
   a. *ANSI A300 - Best Management Practices Fertilization Combo*
   b. ANSI A300 - Best Management Practices Integrated Vegetation Management Combo
   c. ANSI A300 - Best Management Practices Planting Combo
   d. ANSI A300 - Best Management Practices Pruning Combo
   e. ANSI A300 - Best Management Practices Support Systems Combo

C. Tree Technical Manual, City of Palo Alto

1.6 JOB CONDITIONS AND CONSTRUCTION REQUIREMENTS

A. Prior to performing any work on any Contract, Contractor shall call for a site meeting with Architect, Stanford Landscape Architect and SGSCA. This meeting shall occur prior to construction, demolition or access route use of any nature on the project site and related areas including access routes, lay down & staging areas. This meeting shall establish the conditions and methods for preserving all existing trees and the plant materials to be saved. The site shall be photographed to document the

condition of the project area and surrounding site, including access routes, lay-down, staging and office trailer areas, existing landscape plantings and irrigation systems. These photographs shall become the basis for future evaluation should damage occur to the landscape planting and irrigation system during the construction. An arborist report shall also be done and be on file prior to construction.

B. Sequencing Schedule: Coordinate and cooperate with other trades to enable the work to proceed as rapidly and efficiently as possible. Protective fencing shall be in place and approved by an SGSCA before any other work begins on site, including materials delivery and storage.

1.7 SUBMITTALS

A. A Tree Protection and Demolition Plan is required as follows:

1. In preparation for creating the tree protection and demolition plan, contact Stanford Grounds Services for identification of significant and young specimen trees and shrubs.
2. The plan is required to show an accurate representation of all trees over 3" in DBH ~~DSH~~ (diameter at breast ~~standard~~ height) existing on site, any Stanford Grounds designated young specimen trees and significant trees and/or shrubs of any diameter, with indications of which are to be removed, relocated and/or retained on the site. This plan shall include botanical names of species, DBH ~~DSH~~ and canopy diameter.
3. A tree protection fencing plan conforming to the specifications in Part 2, Products shall be included in this plan set.
4. A tree protection fencing plan shall also be included on laydown and construction logistics plans.
5. This Tree Protection and Demolition Plan is to be included in field set of drawings, to be on site for reference at all times during construction.
6. This plan shall be submitted with the project plans for review and must be approved by an SGSCA before construction or pre-construction activity begins, including storage and/or delivery of equipment, temporary construction offices and/or materials, demolition, etc.

B. The following required text shall be included on one sheet in each set of plans:

Stanford University Tree Protection Procedures Summary

1. We have strict requirements which include the points listed below and additional procedures as detailed in the FDG Specifications Guideline 01 56 39 Tree and Plant ~~Shrub~~ Protection.

2. The root zone of all trees must be protected on all construction projects, as described below. A tree's root zone is defined as the area from the trunk out to 10' beyond the dripline.
3. A Stanford Grounds Services Certified Arborist shall be contacted to evaluate all work within any trees root zones.
4. All trees to remain on a project shall have protective fencing installed per the tree protection drawing included in the plan set.
5. Protective fencing shall be chain link on secure footings, or imbedded as required by the Campus Planning and Design Office or a Stanford Grounds Services Certified Arborist, that will not fall over onto trees.
6. Protective fencing shall be placed at the outer edge of the root zone, 10' beyond the tree dripline wherever possible as shown on the tree protection drawing. If project constraints do not allow for fencing at the outer edge of the root zone, fencing must be placed as close to this as possible and approved after it is in place by a Stanford University Grounds Services Certified Arborist.
7. Laydown, staging and parking areas shall be approved by the Stanford University Architect/Campus Planning Department and shall be shown on the plans if within the project limit area, or on the Construction Logistics plan if outside the project limit area. All tree protection guidelines apply to trees in laydown, staging and parking areas as well as to trees within the project limits.
8. Construction materials/equipment/personal vehicles shall not be stored, parked or temporarily placed in the root zone of any trees. Nothing shall be stored or placed temporarily within protective fencing, to avoid soil compaction and soil contamination under trees. Root zones of trees shall not be driven over. Provide alternative routes for construction traffic of any kind including cars, people, tractors, equipment, cranes, or any other traffic and all staging or storage areas.
8. Protect overhanging tree canopies from construction damage. If drive aisles are anticipated under low canopies call for an evaluation by a Stanford Grounds Services Certified Arborist to determine appropriate measures.
10. There shall be no grade change within a minimum of ten feet of the trunk of existing trees, and preferably none within the entire *root zone*. Native oaks are particularly sensitive to grade changes.
11. No rinsing, cleaning equipment or dumping construction liquid materials shall be allowed in the tree root zone, or in an area that drains into the root zone. Care shall be taken in cleaning up equipment. There shall be no storage of dumpsters or accumulated debris from demolition on or around the root zones of existing trees and shrubs.
12. Existing trees shall be monitored weekly and irrigated as needed during the course of construction.

13. No lime or other soil treatment shall be applied without the consent of a Stanford Grounds Services Certified Arborist.
14. All trenching shall conform to the following guidelines.
    a. A Stanford Grounds Services Certified Arborist is required to be present to supervise any trenching, digging or excavation of any kind within a trees' root zone.
    b. Roots larger than 2 inches in diameter shall not be severed without calling a Stanford Grounds Services Certified Arborist for cutting or review.
    c. Tunneling or boring under roots rather than pruning is preferred.
    d. Digging within a tree's root zone shall be avoided. If it is necessary, hand digging shall be used for any trenching within the tree's root zone unless otherwise approved by a Stanford Grounds Services Certified Arborist.
    e. All roots that need to be cut shall be pruned cleanly, not torn.

    The preceding guidelines shall be considered minimum requirements. The greater the distance of tree protection provided the greater the instance of tree success in construction areas.

C. Watering schedule, where interruption of irrigation systems will exceed one watering period, as approved by the Stanford Grounds Services Irrigation Supervisor and Horticultural Supervisor.

D. Construction details for tree, shrub and groundcover protective fencing and barricades as required in Part 2 Products.

E. Construction logistics plan including all laydown areas.

1.8 WARRANTY

A. Contractor shall warrant that all trees, shrubs and groundcover covered by the provisions of this Section will be healthy and in flourishing condition of active growth 1 year from the date of Substantial Completion. Where there has been evidence of neglect or violation of tree protection, the warranty shall extend for **2** years.

B. During the warranty period the Contractor shall be liable for damages to all plant material including trees, shrubs and groundcover. Contractor shall pay compensation or replace plant material if a tree or significant shrub to remain is destroyed or damaged, so that in the judgment of the LA, a Stanford Grounds Services horticultural group staff member or SGSCA it is not healthy and thriving or not able to recover, shall be removed and replaced at Contractor's expense. The replacement plant materials shall closely match in size, color, and variety, the damaged plantings. If replacement of trees is not desired by the LA, liquidated damages will be assessed at the value of the tree

as determined by ISA's most current printing of the *Guide for Plant Appraisal* (listed in 1.5, part A of this Section 01 56 39 document).

C. Damaged shrubs and groundcover shall be replaced in kind and shall match sizes removed or otherwise agreed upon by the Stanford LA.

D. Contractor will not be held responsible for failures due to neglect by the Owner, vandalism, etc., during the warranty period only if such conditions are reported immediately in writing to and reviewed on site by the Stanford Landscape Architect or Stanford Grounds Services and the damage is documented and photographed.

PART 2 PRODUCTS

2.1 A. Tree Protection Fencing

1. All trees retained in place or to be relocated shall be protected with semi-permanent wood or chain link fences on secure footings or imbedded as directed by the Campus Planning and Design Office or SGSCA. The fences shall be placed at the outer edges of the *root zone.*
2. SGSCA must approve fencing after it is in place and before any construction activity begins including delivery of materials or temporary construction office and its site preparation activities.
3. Fences shall be erected before construction begins and remain in place until final inspection of project unless approval by SGSCA is given for temporary relocation to complete work approved in the plans.
4. If the trees are in a small area and cannot be fenced as described, as determined by and with written prior approval from a SGSCA, the tree trunk must be wrapped with orange plastic snow fencing 2-inches thick, or other protection as agreed upon with a SGSCA. While this protects the trunk, caution must be used not to damage the trunk or any branches. Major scaffold limbs may require the same treatment as the above or as directed by the SGSCA.

B. Water: Provide ample water supply of potable quality and sufficient quantity for all operations required under this Section 01 56 39.

PART 3 EXECUTION

3.1 TREE PROTECTION FENCING

A. Install tree protection fencing as described in section 2.1 Products. The entire root zone of all trees to remain or be relocated shall be protected, including all trees on or near the construction site, laydown, staging and parking areas that may be impacted by construction activity.

B. During the course of construction, if relocation of the fence is required to facilitate construction, the Contractor shall do so only under direction of a SGSCA before any work begins, at no additional expense to the Owner.

C. Metal chain link fencing on secure footings imbedded where required by Campus Planning and Design Office or SGSCA shall be used at all times to protect trees except in areas where it will not physically fit. Only in areas where it cannot physically be placed, as determined by SGSCA, will orange plastic snow fencing wrapped 2" thick around the trunk be allowed, and only as approved by an SGSCA. Refer to section 2.1 Products.

3.2 PROTECTION OF TREES AND SHRUBS

A. During the course of construction the Contractor shall take all necessary precautions, as outlined herein, to protect from stress, injury or death all existing trees, shrubs and groundcovers to be preserved on site or relocated. Protection shall be given to the roots, trunk, and foliage of all existing plant materials to remain.

B. Trees, subject to the provisions of this Section, which have been injured shall be repaired immediately by a SGSCA. All costs associated with mitigation of damage to trees to be paid by contractor.

C. Tree protection fencing for trees to remain shall be installed prior to beginning any site work. No construction, demolition, equipment access, or work of any nature will be allowed within the fenced area without prior written approval by LA and/or SGSCA.

1. Approval by LA/ SGSCA for work within the fenced area shall not release the Contractor from any of the provisions specified herein for the protection of existing trees to be preserved.

D. During the course of construction of approved work within the root zone, no roots larger than two inch in diameter shall be cut without prior written approval by SGSCA.

E. SGSCA shall be contacted to coordinate all work of any kind including any trenching, digging or excavation within any trees *root zone*.

F. All branches in all trees canopies shall be protected from damage. If branches need to be pruned, pruning shall be accomplished or supervised by SGSCA.

G. "Excessive pruning", removal of more than one fourth (1/4) of the foliage of a tree in any twelve (12) month period is prohibited.

H. During construction the existing site surface drainage patterns shall not be altered within the area of the *root zone*.

I. Contractor shall not alter the existing water table within area of *root zone*.

J. Contractor shall continuously observe existing vegetation on site and complete necessary measures to maintain healthy living conditions for existing trees, shrubs and groundcover to be preserved. Such measures include notifying a SGSCA promptly if any decline is observed, so mitigation measures can be determined by a SGSCA. These shall include but not be limited to periodic washing of leaves for the removal of dust, soil aeration and supplemental or interim irrigation.

K. Where traffic in a tree's root zone is necessary and approved by a University LA and a SGSCA, the *root zone* shall be tested for compaction and corrective measures as approved by a SGSCA shall be taken to mitigate necessary construction activities. Two to three inches of mulch or steel plates shall be laid down as specified by a SGSCA prior to traffic to reduce compaction.

L. Do not permit the following within the *root zone* of any existing tree to be preserved, or on existing or new lawn areas and groundcover areas.

1. Storage, driving or parking of automobiles or other vehicles or equipment. Root zones of trees shall not be driven over. Provide alternative routes for construction traffic of any kind including cars, people, tractors, equipment, cranes, or any other traffic and all staging or storage areas. Any exceptions must be approved by a University LA and a SGSCA and follow the previous point K.

2. Stockpiling or temporary storage of building materials, soils, dumpsters, accumulated debris or refuse of excavated materials.

3. Skinning or bruising of bark.

4. Use of trees as support posts, power poles, or signposts; anchorage for ropes, guy wires, or power lines; or other similar functions.

5. Dumping of materials on or around trees and roots. Such materials include but are not limited to paint, lime, paint thinner, petroleum products, dirty water, or other deleterious materials.

6. Application of lime or other soil treatment without the consent of a SGSCA.

7. Cutting of tree roots greater than 2 inches in diameter by utility trenching, foundation digging, placement of curbs and trenches, and other miscellaneous excavation without prior written approval by an SGSCA. An SGSCA must be present during all digging or root cutting within a trees *root zone.*

8. Damage to trunk, limbs, or foliage caused by maneuvering vehicles or stacking material or equipment too close to the tree.

9. Compaction of plant ~~shrub~~ areas or tree *root zones* by excessive foot traffic, movement of trucks or grading machines; storage of equipment, gravel, earth fill, or construction supplies; etc.

10. Excessive water or heat from equipment, utility line construction, or burning of trash under or near bushes or trees.

11. Damage to root system from flooding, erosion, puddling or continuous running water, and excessive wetting and drying resulting from dewatering and other operations.

M. Excavation around Trees and Plants ~~Shrubs~~:

1. Excavation within *root zones* of trees shall be done only where absolutely necessary and only with a SGSCA present.

2. Digging, tunneling or boring under or around roots shall be used instead of root pruning wherever possible, as agreed upon by SGSCA. Where trenching for utilities is required within *root zone*, tunneling under and around roots shall be by hand digging. Roots larger than 2" in diameter shall not be cut without prior on site approval from a SGSCA.

3. Where excavation for new construction is specifically required in approved plans within *root zones* of trees, hand excavation, or mechanical boring that goes only under roots without breaking the soil surface, shall be employed with the supervision of a SGSCA to minimize damage to root system.

4. Existing grade of tree at its crown shall be marked with a water based non-toxic paint before construction begins.

5. There shall be no grade changes within a minimum of 10 feet of the trunk of existing trees, and preferably none within the entire *root zone*, as approved by SGSCA.

6. If roots larger than two inches in diameter are encountered, they shall be exposed beyond excavation limits as required for pruning. Roots shall be hand pruned under direction and approval of a SGSCA and treated as exposed roots as stated below in item 8.

7. All roots that need to be cut shall be pruned cleanly, not torn, under direction and approval of a SGSCA. All damaged roots over 2" in diameter shall be pruned leaving a clean face and sealed with non-oil based, alcohol based, wood sealer that disinfects the roots. Sealer

must be pre-approved by the Stanford. University Grounds Services Certified Arborist.

8. Exposed, cut or broken roots shall not be allowed to dry out before permanent backfill is placed, as directed by SGSCA. Temporary earth cover shall be provided, or roots shall be packed with wet peat moss or four layers of wet, untreated burlap and temporarily supported and protected from damage until permanently relocated and covered with backfill. The cover over the roots shall be wetted to the point of runoff daily.

3.3 TREE REMOVAL

A. Dead and damaged trees that are determined by SGSCA to be incapable of restoration to normal growth pattern and/or lifespan shall be removed at the expense of the contractor.

B. Trees designated for removal shall be removed to a point at least 1 foot below the lowest level of sub grade upon which fill will be placed.

C. Soil within a radius of 10 feet of the removed tree under paved area shall receive treatment as recommended by a SGSCA before further preparation of the sub grade.

3.4 PRUNING OF TREES

A. In company with the SGSCA ascertain the limbs and roots which are to be trimmed and clearly mark them to designate the approved point of pruning.

B. A SGSCA shall be engaged to direct removal of branches from trees and large bushes which are to remain if required to clear for new construction.

C. Prune limbs evenly, using proper tools and skilled workpersons under supervision of SGSCA, to achieve neat severance with the least possible damage to the trees.

D. In the case of root cuts, apply wet burlap or other protection, approved by SCSCA, to prevent drying out, and maintain in a wet condition as long as necessary for temporary protection as determined by SCSCA. See the previous section M. for more information.

3.5 REPAIR COMPENSATION

A. Damage to existing tree crowns or roots over 2 inches inch in diameter shall be immediately reported to the Stanford Project Manager and Stanford

Landscape Architect in writing, and at the direction of a SGSCA, repaired immediately at the Contractor's expense,

B. A SGSCA shall supervise repair of trees damaged by construction operations. Repairs shall be made promptly after damage occurs to prevent progressive deterioration of damaged trees.

C. Any tree to remain which is damaged beyond repair or destroyed, as determined by a SGSCA, owing to the Contractor's negligence or failure to provide adequate protection shall be compensated for at the Contractor's expense and paid to Stanford University. Value is dependent on its diameter, species, location, condition and other factors in accordance with the schedule of values in ISA & Council of Trees and Landscape Appraisers most current printing of *Guide for Plant Appraisal* (listed in 1.5, part A of this Section 01 56 39 document)

The following are three examples of the maximum costs that will be expected for a coast live oak (*Quercus agrifolia*) with a 6", 18" and 24" DBH ~~DSH~~ (trunk diameter at breast ~~standard~~ height). The costs were calculated by using the Replacement Cost Method Calculation from the *Guide for Plant Appraisal, 9th Edition* published by ISA & Council of Trees and Landscape Appraisers. -Costs rise as time passes and this estimate was calculated in fall of 2008.

6"	$2,350
12"	$21,300
24"	$26,800

A contractor may be assessed fees of this magnitude if they severely damaged and/or killed a tree as determined by SGSCA or LA. This cost does not include maintenance such as monitoring and watering necessary to re-establish the new tree which would also be the responsibility of the contractor.

D. Damaged tree limbs or trees which have died as a result of injury during construction shall remain the property of Stanford University and shall remain or be removed at the expense of the Contractor as directed by the LA or SGSCA.

3.6 MAINTENANCE

A. During construction: Trees shall be monitored weekly by a SGSCA. Contractor shall monitor and perform maintenance activities as required by LA or SGSCA to ensure that all trees and shrubs to remain are not negatively impacted by construction procedures, throughout the duration of the construction project. This may include, but not be limited to deep watering and or installation of temporary irrigation. Quantities of water to be applied

and lengths of time are variable and shall depend upon seasonal rainfall, soil type and condition, and plant species. Throughout the duration of the project, as deemed necessary by the LA or SGSCA, tree foliage shall be washed down with a hose and water or other means necessary to remove accumulated construction dirt and residues.

B. Contractor shall provide maintenance of trees and shrubs for a maintenance period determined by LA, usually 90 days, to begin after a substantial completion walk-through which includes LA, Grounds Services (including an SGSCA, irrigation supervisor, Grounds maintenance supervisor, and horticultural supervisor); Stanford project manager and contractor.) After 90 days there shall be a final walk through which also include the preceding people. A final punch list shall be prepared and agreed upon at the final walk through.

C. Upon completion of the punch list, maintenance shall be turned over to the responsible party (typically Stanford Grounds Services).

D. Shrubs and trees shall have a warranty for a period of one year. Trees and/or shrubs that die within their warranty period shall be replaced at the expense of the contractor.

E. During construction and contractor maintenance period: Existing and transplanted trees and shrubs to remain shall be monitored every other week by a Stanford Grounds Services staff appointed by the Horticultural Supervisor or the Grounds Services Manager. Reports of work needed to adequately care for and protect these shrubs and trees shall be sent from Grounds Services to the project manager for implementation. The project manager shall report back to Grounds Services and the LA with projected completion date, or for further discussion and resolution if the work cannot be completed due to project constraints.

3.7 CLEAN-UP

A. At close of construction in each area, all protective barriers and any accumulated debris shall be carefully removed without damaging trees or other vegetation at the direction of the LA or SGSCA. All barrier materials shall be transported off site at no additional expense to Owner.

B. All grades and areas of soil compaction shall be repaired, and all damaged plant materials shall be restored as determined by and in conjunction with the LA and Stanford University Grounds Services Department.

END OF SECTION