

SECTION 01 56 39
TEMPORARY LANDSCAPE PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes (but not necessarily limited to) tree and landscape protection for any Work occurring within designated protection areas as shown on Plans or otherwise described in this Specification:
 - 1. Temporary protection and maintenance of existing trees and landscape planting.
 - 2. Excavation or trenching under trees to remain.
 - 3. Prohibited construction activities under trees to remain.
 - 4. Replacement of damaged trees and landscape.
 - 5. Protection and trimming of existing trees that interfere with, or are affected by, execution of the Work, whether temporary or permanent construction
- B. Related work specified elsewhere:
 - 1. Section 32 01 90 – Operation and Maintenance of Planting
 - 2. Section 32 10 00 – Site Clearing
 - 3. Section 32 84 00 – Irrigation (Design Build)
 - 4. Section 32 91 13 - Soil Preparation
 - 5. Section 32 93 00 - Planting

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 REFERENCES

- A. International Society of Arboriculture (ISA) Pruning Standards
- B. American National Standards Institute (ANSI) A300 Pruning Standards; Z133.1 Safety Standards
- C. Pruning Standards for Trees, City and County of San Francisco.
- D. "Arboriculture: Care of Trees, Shrubs and Vines in the Landscape" by Richard W. Harris, Prentice-Hall, Inc. 1983.
- E. Bay-Friendly Landscape Guidelines, StopWaste.Org.

1.04 QUALITY ASSURANCE

- A. Work in this Section shall be by a firm which has successfully completed landscape work similar in quality and extent to that indicated for this project for a period of not less than five (5) years.
 - 1. Supervisory personnel with experience on projects of similar size and extent shall supervise the work.

2. A certified arborist (ISA, ASCA or equivalent) shall be retained by the Contractor and responsible for performing and / or supervising and directing all work on or around existing trees to remain. The arborist shall work in conjunction with the Owner's Project Arborist.
- B. Pre-construction meeting:
1. Prior to commencement of work, person(s) responsible for the Work of this Section shall attend a meeting on the site with the Owner, the Architect, Landscape Architect, General Contractor, and such others as the Owner shall direct to review the proposed schedule, the tree and landscape protection, the coordination with work of other trades, the consideration of substitutions, and the selective thinning and clearing requirements.
 2. Adjustments to the type and extent of the protection shall be addressed at the time of the meeting.
 3. Contractor shall coordinate the meeting and inform all parties in writing five (5) business days in advance of the scheduled meeting.

1.05 PROJECT/SITE CONDITIONS

- A. Existing Conditions. The Contractor should visit the site before submitting a bid in order to understand the following:
1. Nature and location of the work.
 2. General and local conditions including climate, adjacent properties and utilities.
 3. Conformation of the ground.
 4. Character of equipment and facilities needed prior to and during execution of the work.
- B. Discrepancies between Drawings and existing conditions shall be brought to the attention of the Landscape Architect. Work in question shall not proceed until resolved by the Landscape Architect.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Tree Protection Fencing:
1. Two rail wood barriers consisting of 4"x4" posts and 2"x4" rails with an exposed height of four feet above the existing grade, or
 2. 6' tall chain link fencing 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.
 3. Self-supporting chain link fence panels, 6' tall are acceptable on adjacent paved areas, and/or as reviewed by Landscape Architect.
- B. Landscape Protection Fencing:
1. Four foot tall wood picket fencing with angled steel posts.
 2. Six foot tall orange plastic construction fencing.
 3. Materials per Tree Protection or acceptable equivalent.
- C. Organic Mulch. Mulch material shall be as per Section 32 93 00 if retained for final landscape installation. Temporary mulch that is removed after construction shall be 2-inch maximum length, clean, unpainted, untreated wood chip or acceptable equivalent.

- D. Temporary materials, new or used, that are adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable Laws and Regulations, and shall be approved by the Landscape Architect.

2.02 EQUIPMENT

- A. General: Use only the proper tool for each job. Maintain all tools in sharp, properly-functioning condition. Clean and sterilize pruning tools prior to usage.
- B. Insect/Disease Prevention: Take all measures to prevent introduction of insect or disease-laden materials onto the site, per Section 32 9300 Planting and Section 32 0190 Operations and Maintenance of Planting.

PART 3 - EXECUTION

3.01 GENERAL

- A. Tree Protection Zone (TPZ)
 - 1. All construction activity (grading, filling, excavation, paving, landscaping) will respect TPZ around designated trees to be protected, and all trees to remain within areas of construction.
 - 2. The TPZ limit is defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated, or as determined by the Project Arborist.
- B. Landscape Protection Zone:
 - 1. Contractor shall provide Temporary Protection suitable for the protection of the landscape planting immediately adjacent to the construction limit line unless otherwise indicated, or as directed by the Landscape Architect.
- C. The Contractor shall coordinate the location and installation of Temporary Protection with the Clearing work, per the relevant sections of these Specifications, and all other trades and work. All trees to be retained shall be completely enclosed by fencing prior to demolition, grubbing, or grading.
- D. Temporary Protection shall be kept in place for the duration of the Project, maintained during construction, and temporarily relocated as required by the progress of the construction at no additional cost to the Owner
- E. A certified Arborist shall trim and prune trees as directed by the Project Arborist and/or the Landscape Architect within the construction limit line. Trees to be retained shall be pruned to remove dead branches and parasites, and reduce end weight on horizontal branches. Trees shall be shaped and cleaned, if appropriate, to allow light into the center.
- F. The Project Arborist shall over-see activities related to Tree Protection including pruning, grading, trenching, tunneling or other excavation within the root zones of trees to remain as directed by the Owner's Project Manager.
- G. A temporary irrigation system may be required in some locations where required by the Project Arborist. One to several irrigation treatments may be needed for trees that are at risk depending on time of year and extent of construction impact. Existing trees should be monitored weekly and irrigated as needed during the course of construction.

3.02 PREPARATION

- A. Stake the location of Temporary Protection barriers and fencing as noted above for the approval of the Landscape Architect prior to installation. Place location stakes at corners and ends and 30 feet on center maximum.

3.03 INSTALLATION

- A. Install Temporary Protection for tree and landscape planting, as specified herein and as approved in the field by the Landscape Architect. Install all other Temporary Protection in locations approved in the field by the Landscape Architect.
 - 1. Install posts at 10-foot intervals maximum, at corners, and at other changes in direction. Posts shall be set firmly in undisturbed soil, plumb and with a minimum exposed height as specified.
 - 2. Mulching. Spread wood mulch within the areas of Temporary Protection to a 4-to 6-inch depth, leaving the trunk clear of mulch. Limits of mulch may be revised as reviewed and directed by Project Arborist.
- B. Duration. Protection fencing and mulch shall be erected before demolition, grading or construction begins and remain in place until final inspection of the project, except for work specifically allowed in the protected root zones, or as reviewed and approved by the Project Arborist.
- C. Completely remove Temporary Protection, including foundations, associated materials and equipment at the completion of the Project or as directed by the Landscape Architect.
- D. Restore and recondition areas of site damaged or disturbed by barrier installation and removal.

3.04 PROHIBITED ACTIVITIES: The following activities are prohibited under existing tree canopies and within protected landscape planting areas:

- A. Excavating or trenching under tree canopies is prohibited and shall be permitted only under the following conditions:
 - 1. When excavating or trenching within the canopy of trees to remain, the Project Arborist and Landscape Architect shall be given 48 hours notice. Exercise extreme care during excavation to prevent damage to roots and in a manner that will cause minimum damage to the root system. Such work shall not occur without a certified arborist to perform or direct compensatory root and branch pruning.
 - 2. No excavation or trenching is permitted within 8' of tree trunks without prior review and approval by the Project Arborist and Landscape Architect.
 - 3. Any brush clearing shall be accomplished with hand-operated equipment. All trenching within the protected root zones shall be done pneumatically or by hand.
 - 4. Main lateral roots and secondary roots shall not be cut without prior review and approval by the Project Arborist. Roots larger than 2 inches in diameter should not be severed without the review and approval of the Project Arborist. Prune injured roots cleanly and secure small plastic bags to severed root ends (1/2" and larger). Backfill as soon as possible.

5. Special excavation alternatives may be required to protect existing trees and tree roots from impacts of utility (e.g. water, sanitary, storm, electrical) installation. Alternatives include directional boring, tunneling, or Air-spade® excavation with shoring. In any one of these alternatives, roots of 2 inches diameter and larger must remain to bridge the trench, except as directed for cutting by the Project Arborist. Proposed method shall be submitted for review and approval by the Project Arborist and Landscape Architect prior to starting work.
 6. Where tunneling around roots is not practical in the opinion of the Project Arborist, roots shall be cut off approximately six inches (6") from construction. Cover and secure cut ends with small plastic bags.
 7. Exposed roots shall not be allowed to dry out before permanent backfill is placed. Temporary earth cover shall be provided, or exposed roots shall be packed with four (4) layers of wet untreated burlap and temporarily supported and protected from damage until permanently covered with backfill.
 8. Thinning shall not remove more than thirty percent (30%) of the existing leaf surface.
- B. Placing backfill under protected trees unless indicated otherwise. Where fill is required for grading, and as indicated on the Drawings, do not fill above existing grade line at trunks. Fill soil must percolate at a rate of 1" per hour minimum.
 - C. Damage to trunk, canopy, or limbs caused by maneuvering of vehicles or equipment, or stacking of material and equipment.
 - D. Driving or parking vehicles; storage of vehicles, equipment or supplies.
 - E. Disposing of paint, petroleum products, dirty water, soil sterilants, concrete slurry or other deleterious materials on or around roots or on any landscape areas.
 - F. Changing site grades which cause drainage to flow into or to collect within canopies or root zones of protected trees.
 - G. Using protected trees as support posts, power poles, crane stays, sign posts, or anchorage for ropes, guy wires, power lines, or other similar functions.
 - H. Damage to root system from flooding, erosion, excessive wetting or drying resulting from de-watering or other operations.
 - I. Excessive water or heat from equipment, utility line construction, or burning of trash under or near shrubs or trees.

3.05 TREE AND LANDSCAPE REPLACEMENT:

- A. Trees and plants destroyed or damaged beyond repair due to Contractor's negligence, failure to provide adequate protection, or failure to perform recommended selective pruning shall be compensated by the Contractor at no additional cost to the Owner.
 1. Damage beyond repair that requires replacement shall be determined by the Project Arborist or the Landscape Architect.
 2. Replacement shall include the replacement plant material, transportation, installation, a 30 day maintenance period, and a one year warranty.
 3. Planting location for replacements may be different from the original location and shall be determined by the Landscape Architect.
- B. Replace shrubs, ground cover and turf with plants similar in species, size and shape.

- C. Replace trees with plants of same species, size and shape.
 - 1. Replacements for trees of 2" - 8" caliper shall be replaced with similar sized plants; trees over 8" caliper shall be 60" box size.
 - 2. Since age and size of existing tree may prohibit replacement with same size tree, the difference in caliper between size of damaged tree and replacement tree shall be compensated by the Contractor, to the satisfaction of the Landscape Architect.
- D. Contractor shall fell trees to be removed so that trees to remain are not injured.

END OF SECTION

SECTION 12 93 00
SITE FURNISHINGS AND FEATURES

PART 1 - GENERAL**1.01 SUMMARY**

- A. Work Included: Provide site and street furnishings, and install complete, including footings, fittings and materials, as shown, and as specified.
 - 1. Bench
 - 2. Tree Stump Bench (Add Alternate)
 - 3. Handrail
 - 4. Salvaged / Refurbished Gate and Hinges
 - 5. Parallel Fitness Bars (Add Alternate)
 - 6. Horizontal Fitness Bars (Add Alternate)

- B. Related Sections:
 - 1. Section 32 10 00 – Site Clearing
 - 2. Section 32 18 00 – Concrete Sitework and Flatwork
 - 3. Section 32 84 00 – Irrigation (Design-Build)
 - 4. Section 32 91 13 - Soil Preparation
 - 5. Section 32 92 19 – Seeded Turf
 - 6. Section 32 90 00 - Planting

1.02 REFERENCES

- A. "Standard Specifications" - Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS
- B. ACI - American Concrete Institute Manual of Concrete Practice
- C. ASTM - American Society for Testing and Materials
- D. SPIS - Society of Plastic Industry Standards
- E. ACM – Aluminum Construction Manual, current edition

1.03 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Show not less than five (5) years successful and continuous experience in work of the type(s) shown on the Drawings.
- B. Code Requirements
 - 1. Access: Comply with California Building Code and Americans with Disabilities Act Accessibility Guidelines requirements.
 - 2. Code: Comply with requirements of applicable codes.
- C. Field Measurements: Take field measurements prior to preparation of Shop Drawings and fabrication, where possible; do not delay job progress; allow for trimming and fitting where necessary. Provide full size templates as required.
- D. Installer Qualifications:

1. Installer shall have a minimum of five (5) years experience with successfully completed site furnishings work similar in material, design and extent to that indicated for this project.
2. Supervisory personnel with experience on projects of similar size and extent shall supervise the work.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's literature for each type of factory fabricated products and accessories required including, but not limited to:
 1. Bench
 2. Tree Stump Bench (Add Alternate)
 3. Handrail
 4. Gate Hinges
 5. Parallel Fitness Bars (Add Alternate)
 6. Horizontal Fitness Bars (Add Alternate)
- B. Shop Drawings (coordinate with Section 05 5200 Site Metal and Section 06 2013 Exterior Finish Carpentry)
 1. Submit large scale (minimum 3/8 inch) shop drawings for fabrication and erection of:
 - a. Handrail
 2. Verification and coordination:
 - a. Verify all measurements at the job site. Where items must fit and coordinate with finished surfaces and/or constructed spaces, take measurements at site and not from drawings. Where concrete, metal (posts) or other materials must be set to exact locations to receive work, furnish assistance and direction necessary to permit other trades to properly locate their work. Setting Diagrams for Welded Connectors, Concrete, or Masonry Inserts: Where required to receive work, show exact locations and furnish all such Drawings to the trades responsible for installing the connectors or inserts. Show plans, elevations, sections and details of assembly, mounting, inserts, and signs.
 4. Indicate component details, materials, finishes, dimensions, sizes, thicknesses, gauges, connecting and joining methods, attachments, and relationship of work to adjoining construction
 5. Catalogue Work Sheets: Show illustrated cuts of item to be furnished, scaled details and dimensions.
- C. Samples:
 1. Approved samples shall represent standard of quality for workmanship, material and finish.
 - a. Metal Finishes: 6 in. x 6 in. metal sample of each type, actual condition Submit Operations and Maintenance Manuals, Data, Keys and Codes for all manufactured systems.
- E. Mock-ups: Purpose of mock-ups is further verification of selections made establishing a standard of quality expected in the completed work. Upon approval of the samples, build mock-up to comply with the following requirements:
 1. Locate mock-ups on site where indicated or, if not indicated, as directed by the Owner or Landscape Architect.
 2. Provide mockups to serve as the standard of quality for all work:

- a. Tree Stump Bench (Add Alternate): one typical of each type, full sizeNo site furnishings work shall begin until the samples and mockups have been reviewed by the Landscape Architect and becomes the standard of comparison for all respective work.
4. Retain mock-ups during construction. Do not alter, move or destroy section until the work is completed. When directed, demolish mock-ups and remove from site.
5. Mock-ups may be incorporated as part of Work if conforming to specified requirements, and if accepted by the Landscape Architect.

1.05 WARRANTY

- A. Provide two (2) year warranty for materials and installation for the following:
 1. Bench
 2. Handrail
 3. Gate Hinges
 4. Parallel Fitness Bars (Add Alternate)
 5. Horizontal Fitness Bars (Add Alternate)

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Packaging and Labeling: Furnish materials in manufacturer's unopened, original packaging, bearing original labels showing quantity, description and name of manufacturer. Verify that all materials and components are adequately padded and securely bound in such a manner that no damage occurs to the product during delivery and unloading at the site.
- B. Storage: Damaged materials will be rejected. Remove damaged materials from the job site immediately, and pay cost of replacement. Determination of damage shall be the sole authority of the Owner.
- C. Handling: Lift materials using lifting inserts provided by manufacturer.
- D. Painted Finishes: Provide non-scratching, non-staining, firmly-bound covering for all shop-painted finishes until installed and accepted.

1.07 SEQUENCING AND SCHEDULING

- A. Acceptance: Do not install site and street furnishings prior to acceptance by Landscape Architect of area to receive such materials.
- B. Coordination: Coordinate with the work of other sections to insure the following sequence of construction.
 1. Embedded footings and posts: Set concrete footing and anchors in place prior to installation of paving.

1.08 MAINTENANCE

- A. Maintenance Service:
 1. General: Immediately remove all stains to materials or surrounding site improvements. Do not use cleaning solvents harmful to site materials. Do not permit cleaning agents to contaminate planted areas.
- B. Extra Materials:
 1. General: Provide all items necessary to re-tighten, clean up, restore or replace all items as required to ensure continued operation of specified products.

2. Painted Finishes: Provide one gallon can of each primer and finish coat for use in touch-up. Clearly label cans with all batch mixture numbers required to duplicate painted finishes.
3. Patch Kits: Provide patch kit for each type of pre-fabricated product to repair damage due to shipping, handling and/or site conditions. Patch kit shall have matching color(s) and finish of product material.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Bench
 1. Provide Wood Bench as shown on Drawings including wood members; metal supports, bracket assemblies; welded connectors and flanges, and all appurtenances.
 2. Bench shall be backed, wood and metal , "TimberForm Broadway" No. 2626 as available from Columbia Cascade Company (<http://site-furnishings.columbia-cascade.com>, 800.547.1940) or acceptable equivalent.
 - a. Wood seat and back shall be seasoned, solid stock, sustainably harvested from a certified FSC source, S4S.Lumber shall be kiln dried Alaska yellow cedar.
 - 2) Provide shaped lumber and millwork in profile and patterns as shown on Drawings. Sizes, unless otherwise shown, are nominal; actual sizes shall be within manufacturing tolerances allowed by the applicable standard specified.
 - 3) Moisture content shall be within the ranges allowed by applicable woodworking standards.
 - 4) Bench seats are to be sanded smooth and unfinished.
 - b. Metal supports and bracket assemblies shall be shaped steel, powdercoated with a minimum thickness of 6 mils.; color TBD.For hardware not specified on Drawings, utilize stainless steel bolts and fastenings sized for secure, permanent connections in conformance with the industry standard for exterior applications for all concealed connectionsOther materials, as indicated on the Drawings; accessories, finishes, fabrication and metalwork shall conform with applicable Sections in the project Specifications:Tree Stump Bench (Add Alternate)
 1. Provide Tree Stump Bench as shown on Drawings including wood members; metal supports, bracket assemblies, and all appurtenances.
 2. Trunk sections shall be cleaned of all bark, debris, splinters, sap and any materials detrimental to the use intended.
 3. Finished bench shall be finished as required, including filling holes and cracks, sanding and the application of a protective coating as determined by the fabricator, Owner or Landscape Architect. Edges and other exposed or leading corners shall be eased.
- C. Metal Handrails
 1. Metal Handrails shall conform with the Drawings and approved Shop Drawings.
 2. Handrails shall be galvanized steel, primed and painted; color to conform with SF Recreation and Park standard.
 3. Fabricate from steel shapes, tubes and bars to shapes and dimensions as per the Drawings and approved Shop Drawings
- D. Salvaged / Refurbished Gate and Hinges / Hardware

1. Refurbish gate leaf frame and chain link fabric to "new" condition, to match new condition of existing fence material and finish. Provide and incorporate new fabric and framing components as required for a sturdy, secure gate capable of functioning for the intended use.
 2. Gate refurbishment and function shall comply with ADA standards for accessibility, including, but not limited to, smooth kick plate (full width of the gate on the push side, 10" high).
 3. Gate Hinges and Latch shall be refurbished from salvaged existing gate / gate posts, or new to match original type.
 4. Hinges shall be capable of supporting gate and function per ADA standards for opening force (shall not exceed 5 pounds). Provide additional number as required.
- E. Parallel and Horizontal Fitness Bars (Add Alternate)
1. Provide Fitness equipment as indicated on Drawings.
 2. As available from Greenfields Outdoor Fitness, Inc. (www.gfoutdoorfitness.com, 888.315.9037) or acceptable equivalent.

2.02 CONCRETE FOOTINGS:

- A. See Section 32 18 00 - Concrete Flatwork and Sitework and Section 03 00 00 - Cast In Place Concrete

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Locations: Verify that all site and street furnishings can be installed at locations as shown on Drawings.
- B. Conditions: Verify that no defects or errors exist in the work of other sections which would lead to defective installation or latent defects in workmanship and function of items in this section, as follows:

3.02 PREPARATION

- A. Locate and layout all site furnishings. Obtain Landscape Architect's acceptance of layout prior to installation.
- B. Coordinate the installation of on-structure site furnishings with the installation of embeds in the structural slab and the related waterproofing system.
- C. Surface Preparation: Provide proper subgrade preparations and grades.
- D. Concrete Pads and Footings:
1. Layout: Accurately lay out all pads and footings as called for in the Drawings.
 2. Installation: Excavate, form as required and fill for pads and footings as specified in Concrete Sitework and Flatwork- Section 32 18 00

3.03 INSTALLATION

- A. General
1. Locations: Verify that all site and street furnishings can be installed at locations as shown on Drawings. Provide all necessary concrete footings and pads where applicable. Install all site furnishing plumb and true.

2. Conditions: Verify that no defects or errors exist in the work of other sections which would lead to defective installation or latent defects in workmanship and function of items in this section, as follows:
 3. Fabricate free from distortion and defects detrimental to appearance and performance. Preassemble items in shop in largest practical sections, to greatest extent possible to minimize field splicing and assembly.
 4. Coordinate the installation of the work with the installation of the pavement work and drainage systems. Do not damage any other installed work during installation. Report any damage immediately to the Landscape Architect.
 5. Erect work square, set products accurately in location, alignment and elevation, plumb, level and true measured from established lines and levels, and free from distortion or defects detrimental to appearance and performance.
 6. Install all site furnishings in accordance with Drawings, and manufacturer's written instructions unless otherwise indicated.
 7. Restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location.
 8. Touch up all metalwork, hardware, fasteners and areas where shop coat finish has been damaged with primer and paint in matching color.
- B. Bench, Handrails and Salvaged Gate and Hinges.
1. Review of Locations: Landscape Architect to review and accept final locations of site furnishings on-site prior to installation.
 2. Coordinate the installation of the site furnishings with the installation of the concrete, and pavement work.
 3. Secure site furnishings plumb and level with concealed surface mounting per manufacturer's written recommendations.
 4. Gate shall be mounted as indicated on the existing fence framing with new or salvaged/refurbished hinges and latch. Install gate to comply with ADA standards for accessibility, including maximum opening force (5 pounds) and smooth kick plate on the push side.
- C. Tree Stump Bench and Fitness Bars (Add Alternates)
1. Coordinate the installation of the work with the installation of the pavement and grading work.
 2. Install fitness bars level and plumb at height indicated per manufacturer's written recommendations.
- D. Concrete Footings
1. Coordinate with building construction, waterproofing and drainage systems and pavement installation for related site furnishings.
 2. Install per Drawings, plumb and level.
 3. Top of footings shall be as indicated in the Drawings.

3.04 SHOP COAT REPAIR

- A. Touch up painted steel abrasions and welds with the specified primer and paint.

- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

3.05 PROTECTION AND CLEANUP

- A. Wrappings: Do not remove protective wrappings from furnishings until instructed by Landscape Architect.
- B. Protect work from damage or theft until Final Acceptance. Repair or replace damaged work to original condition.
- C. Keep site clean during construction. At Final Acceptance, finished work under this Section shall be in place, operable, clean and in undamaged condition, ready for use.
- D. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris and equipment

END OF SECTION

SECTION 32 01 90**OPERATION AND MAINTENANCE OF PLANTING****PART 1 - GENERAL****1.01 SUMMARY**

- A. Work Included: Provide continuous Landscape Maintenance, complete as specified during progress of the work, after installation, and for a period of 90 days after Preliminary Acceptance / Substantial Completion.
- B. Related Work:
 - 1. Section 32 84 00 - Irrigation (Design Build)
 - 2. Section 32 91 13 - Soil Preparation
 - 3. Section 32 92 19 – Seeded Turf
 - 4. Section 32 93 00 - Planting

1.02 REFERENCES

- A. International Society of Arboriculture (ISA) Pruning Standards
- B. "Arboriculture: Care of Trees, Shrubs and Vines in the Landscape" by Richard W. Harris, Prentice-Hall, Inc. 1983.
- C. Bay-Friendly Landscape Guidelines, StopWaste.Org.
- D. University of California Agriculture and Natural Resources. UC IPM Online Statewide Integrated Pest Management Program: www.ipm.ucdavis.edu
- E. University of California Cooperative Extension Publications:
 - 1. "Fertilizing Woody Plants", Leaflet #2958, Sept. 1979.
 - 2. "Pruning Landscape Trees", Leaflet #2574, Jan. 1979.
 - 3. "Staking Landscape Trees", Publication #AXT-311.

1.03 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Experience: The landscape contractor or maintenance subcontractor shall have a full-time employee assigned to the job as foreman for the duration of the contract. He/she shall have a minimum of four (4) years experience in landscape maintenance supervision, with experience or training in turf management, entomology, pest control, integrated pest management, soils, fertilizers, plant identification, sustainable landscape maintenance practices and be familiar with the Bay-Friendly Landscape Guidelines.
 - 2. Labor Force: The landscape maintenance labor force shall be thoroughly familiar with, and trained in, the work to be accomplished and shall perform the task in a competent, efficient manner acceptable to the Owner.
- B. Requirements:
 - 1. Supervision: The foreman shall directly supervise the work force at all times. Notify Owner of all changes in supervision.
 - 2. Identification: Provide proper identification at all times for landscape maintenance firm's vehicles and labor force. Be uniformly dressed in a manner satisfactory to the Owner.

1.04 SUBMITTALS

- A. Quality Control Submittals:
 - 1. Schedule of maintenance operations and monthly status report including list of equipment, materials proposed for the job and watering schedule.
 - 2. Licenses, permits and insurances required by the City and County of San Francisco, CA, and the State or Federal government pertaining to maintenance work.
 - 3. Monthly record of all herbicides, insecticides and disease control chemicals used for the project.
 - 4. Documentation of planting and irrigation system.
 - 5. Written application recommendation by a licensed agricultural pest control advisor for all weed, pest and disease controls restricted by the Director of Agriculture proposed for this work.
- B. Project Close-out Submittal: Include in a single, 3-ring binder a landscape maintenance manual containing an indexed collection of all schedules, records and permits listed above, as well as a documentation of accepted condition of planting and irrigation at Final Acceptance.

1.05 PROJECT/SITE CONDITIONS

- A. Site Visit: At beginning of Maintenance Period, visit and walk the site with the Owner's representative to clarify scope of work and understand existing project/site conditions.
- B. Documentation of Conditions: Document general condition of trees, shrubs, vines, groundcovers and lawn, recording all plant materials which are healthy, thriving, damaged, dead or dying.
- C. Irrigation System: Document general condition of irrigation system, making sure that faulty electrical controllers, broken or inoperable sprinkler heads or emitters are reported. Verify that ET controller has been properly programmed for plant establishment and readjusted for optimal performance of plants.

1.06 SEQUENCING AND SCHEDULING

- A. Perform all maintenance during hours mutually agreed upon between Owner and Contractor.
- B. Work force shall be present at the project site at least once a week and as often as necessary to perform specified maintenance in accordance with the approved maintenance schedule.

1.07 WARRANTY

- A. Specific Requirements: Refer to the following sections:
 - 1. Section 32 93 00 - Planting
 - 2. Section 32 84 00 - Irrigation

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. General: Use local products and suppliers (as defined by 150 mile radius from project) to the extent possible to minimize fuel consumption and emissions. Use salvaged and recycled-content products where possible. (such materials can be located at the following websites: www.calrecycle.ca.gov and www.stopwaste.org).

- B. General: All materials and equipment, shall be provided by the Contractor, except as specified below.
 - 1. Water: Clean, potable and fresh, as available from Owner
 - 2. Fertilizers:
 - a. Use only where prescribed by soil laboratory reports
 - b. Use only locally organically produced compost in lieu of chemical fertilizers.
 - 3. Herbicides, Insecticides, and Fungicides:
 - a. Use only where prescribed by IPM consultant
 - 4. Replacement Tree Guys, Stakes, Ties and Wires:
 - a. Match originally accepted existing materials on the site.
 - b. Tree stakes to be removed after one year from the date of final approval.

2.02 EQUIPMENT

- A. General: Use only the proper tool for each job. Maintain all tools in sharp, properly-functioning condition. Clean and sterilize pruning tools prior to usage.
- B. Fuel conservation: Implement strategies in work operations to reduce fossil fuel consumption and emissions.
 - 1. Use hand-powered equipment when possible.
 - 2. Minimize use of gas-powered blowers, especially on planting beds.
 - 3. Select smallest, most fuel efficient equipment to accomplish task.
 - 4. Consider vehicles that operate on natural gas or biodiesel.
 - 5. Maintain equipment properly and keep it well tuned.
 - 6. Emphasize employee carpooling to project.
- C. Repair equipment oil leaks immediately and at an alternate location from project site.
- D. Insect/Disease Prevention: Take all measures to prevent introduction of insect or disease-laden materials onto the site. Planting - Section 32 93 00.

PART 3 - EXECUTION

3.01 GENERAL

- A. Provide continuous landscape maintenance during progress of Work and during the Maintenance Period.
- B. Contractor shall furnish sufficient workers and adequate equipment to perform Work during the Maintenance Period.
- C. Any day that Contractor fails to adequately perform landscape maintenance, as determined necessary by the Owner or the Landscape Architect, that day will not be credited as one of the working days of the landscape Maintenance Period.
- D. Maintenance Period will be extended due to improper landscape maintenance and poor condition of planting at termination of the scheduled landscape maintenance. Continued landscape maintenance shall be at no additional cost to the Owner.

3.02 ESTABLISHING THE MAINTENANCE PERIOD

- A. Preliminary Review: As soon as planting is substantially completed per documents, hold a preliminary review to determine the condition of the work.

- B. Date of Review: Notify Landscape Architect at least five (5) working days prior to anticipated date of review.
- C. Beginning of the Maintenance Period: The date recommended by the Landscape Architect in a field report issued to the Owner.

3.03 PREPARATION

- A. Protection:
 - 1. Protect all new planting areas from damage of all kinds from beginning of work until sufficiently established or until Final Acceptance.
 - 2. Provide temporary protection fences, barriers and signs as required for protection.
- B. Replacements:
 - 1. Immediately treat or replace all plants which become damaged or injured as a result of Contractor's operations or negligence, as directed by Landscape Architect, at no cost to Owner.
 - 2. Replacement plants shall match size, condition and variety of plants replaced.

3.04 PLANTING, GENERAL

- A. Watering Basins:
 - 1. Maintain all watering basins around plants so that enough water can be applied to establish moisture through major root zones.
 - 2. Check for moisture penetration throughout the root zone at least twice a month.
 - 3. Water as frequently as necessary to maintain healthy growth of planting through establishment and adjust irrigation to a regular cycle after establishment.
 - 4. For supplemental hand watering of watering basins, use a water wand to break the water force. Do not permit use of "jet" type watering equipment. Do not permit crown roots to become exposed to air through dislodging of soil and mulch.
 - 5. Maintain originally called for depth of mulch to reduce evaporation and frequency of watering.
 - 6. In rainy season, open basins to allow surface drainage away from the root crown where excess water may accumulate. Restore watering basins at end of rainy season.
 - 7. At end of rainy season, form watering basins at trees as specified in drawings
- B. Resetting: Reset plants to proper grades and upright position.
- C. Weed Control:
 - 1. All areas between plants, including watering basins, shall be weed free at all times.
 - 2. Hand weed whenever possible. Use only recommended and legally approved herbicides to control weed growth if hand weeding is not effective.
 - 3. Do not hoe weeds. Avoid frequent soil cultivation that destroys shallow roots and breaks the seal of pre-emergent herbicides.
- D. Pruning:
 - 1. Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached, and which support the natural growth pattern of each tree species.
 - 2. Prune trees to eliminate diseased or damaged growth, and narrow V-shaped branch forks that lack strength. Where necessary, reduce toppling and wind damage by tip pruning as required. Do not thin out crowns.

3. Prune trees to maintain growth within space limitations, maintaining a natural appearance.
 4. No stripping of lower branches of young trees will be permitted.
 5. Retain lower branches in a "tipped back" or pinched condition to promote trunk caliper growth. Do not cut back to fewer than six buds or leaves on such branches. Only cut lower branches flush with the trunk after the tree is able to stand erect without staking or other support.
 6. Tip prune and shape evergreen trees when necessary to prevent wind and storm damage. Do primary pruning of deciduous trees during the dormant season. Do not permit any pruning of trees prone to excessive "bleeding" during growth season.
 7. Prune damaged trees or those that constitute health or safety hazards at any time of year as required.
 8. Make all cuts clean and close to the trunk, without cutting into the branch collar. "Stubbing" will not be permitted. Cut smaller branches flush with trunk or lateral branch. Make larger cuts (1 in. in diameter or larger) parallel to shoulder rings, with the top edge of the cut at the trunk or lateral branch.
 9. Branches too heavy to handle shall be precut in three stages to prevent splitting or peeling of bark. Make the first two cuts 18 in. or more from the trunk to remove the branch. Make the third cut at the trunk to remove the resulting stub.
 10. Do not prune or clip shrubs into balled or boxed forms unless specifically called for by design.
 11. Take extreme care to avoid transmitting disease from one infected plant to another. Properly sterilize pruning tools before going from one infected plant to all other plants.
- E. Guying of Trees:
1. See drawings for guying details.
 2. Reset trees as required per original details to re-establish installed alignment.
- F. Fertilization:
1. Use compost or compost tea if plants show transplant shock. Do not use fertilizers unless soil test shows specific nutrient deficiencies.
- G. Replacements:
1. Replace dead and missing plants as per requirements of Maintenance Period and Warranty Period.
 2. Damages due to Contractor's negligence shall be paid for without charge to Owner.
- H. Mulch
1. Maintain a 3" layer of mulch in all planting areas.
 2. Mulch materials shall match original installed material.
 3. Do not use chipped or shredded plant debris wood chips from pruning operations.

3.05 INTEGRATED PEST MANAGEMENT

- A. Inspection: Inspect all plant materials for signs of stress, damage and potential trouble from the following:
1. Presence of damaging insects, gophers, snails and slugs in planting areas.
 2. Discolored or blotching leaves.
 3. Unusually light green or yellowish green color inconsistent with normal green color of leaves.
- B. Insects and diseases

1. Key Plant: key pests- Contractor shall identify primary plant species and cultivars in the landscape (key plants) and the pests that commonly cause significant harm to plant health and appearance (key pests).
2. Monitoring: Contractor shall monitor landscape areas to identify presence of beneficial insects and pests, determine populations, life stage, and degree of damage to plants. Key plants: key pests will be monitored closely during normal periods of pest activity. This information will be the basis on which pest control methods are initiated. Records of monitoring activity shall be kept.
3. Controls: Control pests without harming non-target organisms, or negatively affecting air and water quality and public health. Use practices of IPM and only resort to chemical methods when non-chemical methods are not keeping pests below acceptable levels. When pesticides are required, use the least toxic and least persistent pesticide that will provide adequate pest control. Do not apply pesticides on a prescheduled basis.
 - a. Cultural/mechanical/physical methods:
 - 1) Adjust pruning or fertilizing timing to make the environment unfavorable to pest reproduction, movement, or survival.
 - 2) Foster healthy soil, judiciously fertilize when needed and manage irrigation appropriately.
 - 3) Prune to remove infected or infested branches and shoots. Time pruning to avoid periods of insect infestation.
 - 4) Remove fallen twigs, leaves, and fruit that contain disease inoculum.
 - 5) Mulch soil surface to reduce weeds and to reduce the splashing of mud that would protect spores deposited on plant surfaces.
 - 6) Trap insects using sticky surfaces (use also for monitoring). Trap rodents with mechanical traps.
 - 7) Bring to attention of agency plants that are disease or insect prone and suggest resistant replacements or species better suited for site and microclimate.
 - b. Biological methods: pesticides of natural origin that have limited or no adverse effects on the environment or beneficial organisms. It is critical to determine the effective biological control and proper timing of application. When cultural/mechanical/physical methods are not adequate, consider the following control methods to lower pest populations to target levels:
 - 1) Bacillus thuringiensis
 - 2) Parasitic nematodes
 - 3) Pheromone traps
 - 4) Beneficial insect release and conservation
 - c. Pesticides: Insecticides, fungicides, and other substances used to control pests. When Cultural/mechanical/physical and Biological methods have provided inadequate pest control, the Contractor may apply an appropriate least-toxic pesticide as a last resort. Application must be timed to the appropriate life stage of the pest. Examples as follows:
 - 1) Insecticidal soaps
 - 2) Horticultural soaps
 - 3) Herbicidal soaps
 - 4) Neem
 - 5) Pyriproxyfen insect growth regulator (e.g. Distance IGR)

- d. Do not use pesticides that have been prohibited by Organic Materials Research Institute (OMRI) in its generic materials list. Restricted chemicals:
 - 1) Organophosphate-containing pesticides. Examples as follows:
 - a) Diazinon, trade names Spectracide, Knox-out
 - b) Chlorpyrifos, trade names Dursban, Pageant
 - c) Malathion and carbaryl, trade names Sevin
 - 2) Pyrethroids and pyrethrins containing piperonyl butoxide (PBO)
 - 3) Any pesticide of Toxicity category I or II
 - 4) Any pesticide containing a chemical known to the State to cause cancer or reproductive toxicity pursuant to the California Safe Drinking Water and Toxic Enforcement Act of 1986.
 - 5) Any pesticide classified as a human carcinogen, probable human carcinogen or possible human carcinogen by the United States Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances.
- e. Notice of pesticide use: Signs shall be posted at least three days before application and remain posted four days following the application of pesticide(s).
- f. Recordkeeping and reporting
 - 1) Contractor shall maintain records of all pest management activities.
 - 2) Submit the pest management report to the Owner on a monthly basis.
 - 3) Each record shall include the following:
 - a) Target pest
 - b) Type and quantity of pesticide used
 - c) Site of the pesticide application
 - d) Date the pesticide was used
 - e) Name of the pesticide applicator
 - f) Application equipment used
 - g) Prevention and other non-chemical methods of control used

3.06 WEED MANAGEMENT

- A. Identify key weeds present and design weed manage program to target those species.
- B. Invasive plants may have been present on-site prior to landscape installation or inadvertently included in planting. Seedlings and/or suckers shall be removed by contractor.
- C. Controls
 - 1. Cultural/mechanical/physical methods shall be used as the first choice in weed management.
 - a. Monitor planting areas frequently to identify and eradicate weeds early in the growth stage prior to their setting seed.
 - b. Cut or pull weeds using hand operated equipment where possible.
 - c. Mulches shall be maintained at all times over soil surface that is not covered by vegetation. Apply through sheet mulching technique when possible.
 - d. Propane-fueled flamers may be used in winter and spring with required permits and approval by Fire Marshall to kill early-season weeds by heating the cells until they burst. The weed quickly wilts and dies.
 - 2. Least toxic herbicides may be employed by Contractor as a last resort. Examples are as follows:

- a. Fatty acid potassium salts (herbicidal soaps e.g. Safer's Superfast Weed and Grass Killer, Dr. Bronner's Peppermint Anti-Bacterial Soap)
 - b. Acetic and citric acids (e.g. Nature's Glory Weed and Grass Killer)
 - c. Clove, citrus, mint, and thyme oils
 - d. Corn gluten
 - e. Low-toxic, low-residual herbicide (e.g. Round-up)
3. Do not use herbicides that have been prohibited by Organic Materials Research Institute (OMRI) in its generic materials list. The following herbicides are restricted and may not be used (identified as contaminants of either water or compost)
- a. Atrazine (Aatrex)
 - b. Simazine (Princep)
 - c. Bromacil (Hyvar, Krovar)
 - d. Prometon (Pramitol)
 - e. Bentazon (Basagran)
 - f. Norflurazon (Solicam, Predict, Zorial)
 - g. Picloram
 - h. Clopyralid

3.07 WASTE MANAGEMENT

- A. General: minimize waste production, use plant debris generated on-site as much as possible, recycle plant debris and discarded materials to the maximum extent feasible.
- B. Retain natural leaf litter and other organic material in shrub beds. Where leaf litter detracts from landscape appearance it is preferable that leaves be chopped and returned to the landscape. Remove diseased leaves that would provide inoculum for plant infection.
- C. All excess plant debris must be separated from other refuse and take to a facility where it will be used to produce compost or mulch.
- D. Recycle waste

3.08 IRRIGATION SYSTEM

- A. General:
 1. Repair without additional charge to Owner all damages to system caused by Contractor's operations. Perform all repairs within one (1) watering period.
 2. Report promptly to Owner all accidental damage not resulting from Contractor's negligence or operations.
 3. Set and program automatic ET controller with proper soil information, water needs of plants, orientation of irrigation zones, and adjust throughout establishment period and final growth period after establishment.
 4. Twice a month, use a probe or other acceptable tool to check the rootball moisture of representative plants as well as the surrounding soil.
- B. Cleaning and Monitoring the System:
 1. Continually monitor the irrigation systems to verify that they are functioning properly as designed. Make program adjustments required by changing field conditions.
 2. Clean pump filter and strainer at least once a year and as often as necessary to keep the irrigation systems free of sand and other debris.

3. Prevent spraying on windows, building walls, and play areas by balancing the throttle control on the remote control valves and the adjustment screws on the sprinkler heads. Do not allow water to atomize and drift.

3.09 TERMINATION OF THE MAINTENANCE PERIOD

- A. Final Acceptance Procedure:
 1. Work will be accepted by the Landscape Architect upon satisfactory completion of all work, including maintenance period, but exclusive of replacement of materials under the Warranty Period.
 2. Submit a written request to Landscape Architect for review for Final Acceptance at least five (5) working days prior to anticipated Final Review date, which is at the end of the Maintenance Period.
- B. Corrective Work:
 1. Work requiring corrective action or replacement shall be performed within ten (10) calendar days after the Final Review.
 2. Perform corrective work and materials replacement in accordance with the Drawings and Specifications, and shall be made by the Contractor at no cost to the Owner.
 3. After corrective work is completed, the Contractor shall again request a Final Review for Final Acceptance as outlined above.
 4. Continue maintenance of all landscaped areas until such time as all corrective measures have been completed and accepted.
- C. Conditions for Acceptance of Work at End of Maintenance Period:
 1. Each plant shall be alive and thriving, showing signs of growth and no signs of stress, disease, or any other weaknesses.
 2. Replace all plants not meeting these conditions. An additional Warranty Period equal in length to the original shall be commenced for all such plants and planted areas.
- D. Final Acceptance Date: The date on which the Landscape Architect issues a Letter of Final Acceptance. Upon Final Acceptance, the Owner will assume responsibility for maintenance of the work.

3.10 CLEANING

- A. Dispose of all pruned materials, retain lawn clippings in lawn, sweep all walkways. Avoid walking in planting areas where possible.
- B. Remove from the site all containers and evidence of maintenance activities.

3.11 CLOSE OUT

- A. Landscape Maintenance Record: Submit binder to Owner with all documentation and records required and utilized during the maintenance period.
- B. Keys and Identification: Return all keys and identification materials supplied by Owner for the purpose of site access.

END OF SECTION

SECTION 32 10 00**SITE CLEARING****PART 1 - GENERAL****1.01 SUMMARY**

- A. The work of this section consists of
 - 1. Selective clearing, and grubbing
 - 2. Selective salvaging (tree trunks, gate and gate hardware)
 - 3. Removing and disposing of trees, vegetation
 - 4. Topsoil stripping
 - 5. Removing site improvements
 - 6. Disconnecting, capping or sealing, and abandoning site utilities in place.
 - 7. Removal of debris.
- B. Related Work:
 - 1. Section 01 56 39 - Temporary Tree and Landscape Protection
 - 2. Section 12 93 00 – Site Furnishings and Features
 - 3. Section 32 91 13 - Soil Preparation
 - 4. Section 32 93 00 - Planting

1.02 REFERENCES

- A. International Society of Arboriculture (ISA) Pruning Standards
- B. "Arboriculture: Care of Trees, Shrubs and Vines in the Landscape" by Richard W. Harris, Prentice-Hall, Inc. 1983.
- C. Bay-Friendly Landscape Guidelines, StopWaste.Org.
- D. University of California Agriculture and Natural Resources. UC IPM Online Statewide Integrated Pest Management Program: www.ipm.ucdavis.edu.

1.03 PROJECT/SITE CONDITIONS

- A. Site Visit: Prior to beginning the work, visit and walk the site with the Owner's representative to clarify scope of work and understand existing project/site conditions.
- B. Documentation of Conditions: Document general condition of existing trees, shrubs, vines, groundcovers and lawn recording all plant materials which are healthy, thriving, damaged, dead or dying.
- C. Material Ownership: Except for materials indicated to be stockpiled or identified to remain the Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.
- D. Do not close or obstruct adjacent street, drive lanes, utility easements, walks, and exit passageways without permission of authorities having jurisdiction.
 - 1. Keep streets and sidewalks clean.
- E. Protection of persons and property:

1. Barricade open depressions and holes occurring as part of work, and post warning lights on property adjacent to or with public access.
 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required to ensure safety of persons.
 3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by operations of this Section.
- F. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. Maintain access to site at all times.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Tree Paint. Approved base paint prepared especially for tree surgery
- B. Backfill Material. As specified in Section 32 91 19 Soil Preparation

2.02 EQUIPMENT

- A. General: Use only the proper tool for each job. Maintain all tools in sharp, properly-functioning condition. Clean and sterilize pruning tools prior to usage.
- B. Fuel conservation: Implement strategies in work operations to reduce fossil fuel consumption and emissions
 1. Use hand-powered equipment when possible.
 2. Select smallest, most fuel efficient equipment to accomplish task.
 3. Maintain equipment properly and keep it well tuned.
- C. Repair equipment oil leaks immediately and at an alternate location from project site
- D. Insect/Disease Prevention: Take all measures to prevent introduction of insect or disease-laden materials onto the site. Refer to Section 32 93 00 – Planting.

PART 3 - EXECUTION

3.01 PROTECTION AND SALVAGE

- A. Identify and protect all existing utilities from damage, prior to construction.
- B. Verify that survey benchmark and intended elevations for the work are as indicated.
- C. The Contractor is responsible for the protection of existing improvements.
- D. Work shall not begin until temporary fences, barricades, warning signs, and pedestrian and vehicular control devices are installed.
- E. Conform with Section 01 56 39 Temporary Landscape Protection
- F. Salvage and store designated items as directed by Owner and/or Landscape Architect.
 1. Cut tree trunk(s) into sections to facilitate fabrication as bench elements described in Drawings and Section 12 93 00 – Site Furnishings and Feature.

- a. Grub out stump and roots as described herein.
2. Remove, clean and refinish existing gate and hinges; coordinate with Section 12 93 00 Site Furnishings and Feature.
 - a. Restore gate leaf frame and chain link fabric to "new" condition, matching existing fencing.
 - b. Refurbish hinges to the extent possible for reuse with the restored salvaged gate. Hinges shall be capable of supporting gate and function per ADA standards for accessibility.

3.02 CLEARING

- A. Remove all trees, brush, and vegetation from areas designated to be cleared. As directed, trim low hanging, unsound, or unsightly branches on trees and shrubs designated to remain. Make cuts flush with trunk or branch. Paint cuts larger than 1/2-inch in diameter with tree paint.
- B. All clearing and cutting of vegetation taller than 2-feet must be approved by the Owner's representative five days in advance.
- C. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- D. Recycle any site material where possible, including sidewalk and building concrete, asphalt pavement (engineered fill/asphalt paved areas), fences and trees for mulch.

3.03 EXISTING UTILITIES AND BUILT ELEMENTS

- A. Protect existing reference points, including bench marks and monuments
- B. Protect adjacent properties and public rights-of-way from sedimentation by placing and maintaining erosion control measures, identified on grading plan.
- C. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
 1. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
 2. Arrange to shut off indicated utilities with utility companies.
- D. Protect existing utilities to remain from damage.
- E. Do not disrupt public utilities without permit from authority having jurisdiction.
- F. Protect existing structures and other elements that are not to be removed.
- G. Remove existing above and below grade improvements, such as slabs, paving, curbs, gutters, and aggregate base, as indicated.
 1. Unless full depth joints coincide with line of demolition, neatly saw cut existing pavements between sections to remain and portions to be removed.
- H. Restore damaged site improvements to their original condition.

3.04 VEGETATION

- A. Remove trees, shrubs, brush, and stumps in areas to be covered by new site and landscape improvements.
 1. Removal includes digging out of stumps, obstructions, and grubbing roots. Obstructions include rock larger than 4 inches.

2. Remove to a depth of 18 inches below exposed subgrade under site improvements, and to a minimum depth of 12 inches in areas of landscaping.
 3. Treat remaining roots with herbicide per Manufacturer's instructions and in accordance with governmental regulations.
- B. Do not permit vehicles, equipment or foot traffic within drip line of trees to remain.
- C. Do not excavate within drip line of trees to remain, unless otherwise indicated.
- D. Do not remove or damage vegetation beyond the limits indicated on drawings.
- E. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
1. At vegetation removal limits.
 2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
 3. Around other vegetation to remain within vegetation removal limits.
- F. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.
- G. All grubbing must be approved by the Owner's representative five days in advance. Use hand methods for grubbing inside drip line of trees to remain. Backfill in accordance with Section 32 91 13 Soil Preparation.
- H. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 3. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
- I. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.
1. Engage a qualified arborist to propose details of proposed repairs and to repair damage to trees and other vegetation to remain.
- J. Fill depressions caused by clearing and grubbing operations with soil materials specified in Section 32 91 13 for fill materials, unless further excavation or earthwork is indicated.
1. Structural fill is required for depressions that occur in areas where site improvements, such as buildings and pavements, are shown.

3.05 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of at 12 inches minimum at areas of new site improvements.
- C. Stockpile topsoil in an area clear of new construction, without intermixing with subsoils.
- D. Maintain topsoil stockpile in a manner that does not obstruct the natural flow of drainage on the site.
1. Shape stockpile to drain water.

2. Maintain stockpile free from debris and trash.
3. Keep the topsoil damp to prevent dust and drying out.
4. Cover to prevent windblown dust.

3.06 DEBRIS

- A. Remove surplus soil material, unsuitable topsoil, demolished material, obstructions, brush, grass, roots, and other debris from the site.
 1. Legally dispose of material removed from site.
- B. Remove debris, junk, and trash from site.
- C. Do not burn debris at site.
- D. Leave site in clean condition, ready for subsequent work.
- E. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 32 12 16**ASPHALT CONCRETE PAVEMENT (ADD ALTERNATE)****PART 1 - GENERAL****1.01 SUMMARY**

- A. This Section includes provisions for constructing new asphalt concrete pavement.
 - 1. Asphalt Concrete Pavement
 - 2. Liquid Asphalt and Asphalt Emulsion
 - 3. Aggregate Base
- B. Related work specified elsewhere:
 - 1. Section 01 56 39 - Temporary Landscape Protection.
 - 2. Section 32 10 00 – Site Clearing
 - 3. Section 32 18 00 – Concrete Sitework and Flatwork
 - 4. Section 32 91 13 - Soil Preparation

1.02 REFERENCES

- A. DPW Standard Specifications (SSDPWSF), revised November, 2000.
- B. Caltrans Standard Specifications (CTSS), revised July, 2013.
- C. Caltrans Standard Special Provisions, dated 2010

1.03 QUALITY ASSURANCE:

- A. Asphalt concrete pavement work shall be by a state licensed Landscape Contractor with a minimum of ten years of professional experience which has successfully completed asphalt concrete pavement work similar in quality and extent to that indicated for this project for a period of not less than five (5) years.
- B. Supervisory personnel with experience on projects of similar size and extent shall supervise the work.
- C. Compaction: In accordance with the requirements of Section 212.09 of the DPW Standard Specifications

1.04 SUBMITTALS

- A. Within 30 days prior to starting construction, the Contractor shall submit the asphalt concrete mix design, including the amount of asphalt binder to be mixed with the dry aggregate to the City Representative for approval. No work will be allowed prior to the approval of the mix design. Asphalt concrete mix design will conform to Section 39 of the 2010 Caltrans Standard Specifications and as modified below under Article "Materials".
 - 1. Include all submittals in a single package for a single review.
 - 2. Ensure that each sample, cut sheet, product data and test is clearly marked or labeled to correlate it to its specification, identifying the product, manufacturer and source.
- B. Provide two copies of material certificates signed by the material producer and the Contractor, certifying that each material item complies with or exceeds specified requirements.

- C. The Contractor shall furnish a certified weight or load slip for each load of material used in the construction of the asphalt concrete pavement

1.05 PROJECT CONDITIONS

- A. Asphalt Concrete Pavement:
 - 1. Asphalt concrete surfaces shall be constructed only when ambient temperature is above 50 degrees Fahrenheit and when base is dry.
- B. Liquid Asphalt and Asphalt Emulsion:
 - 1. Prime coat, seal coat, and paint binder shall be applied only when the ambient temperature is above 50 degrees Fahrenheit and when temperature has not been below 35 degrees Fahrenheit for 12 hours immediately prior to application.
 - 2. Prime coat, fog coat, seal coat, and paint binder shall not be applied when base or surfaces are wet or contain excess moisture

PART 2 - PRODUCTS

2.01 MATERIALS

- A. The Contractor is encouraged to use Reclaimed Asphalt Pavement (RAP) in accordance with the 2010 Caltrans Standard Specifications and Standard Special Provision (SSP) 39-010. Specifically, refer to 2010 CTSS Section 39-1.02F outlining current maximum RAP substitution rate. Minimum RAP substitution rate shall be 15% of the aggregate blend.
- B. Paving asphalt to be mixed with aggregate shall be steam-refined asphalt, AR- 4000, conforming to Section 92 of the Caltrans Standard Specifications.
 - 1. Mineral aggregate shall be Type B mineral aggregate as specified in Section 39 of the Caltrans Standard Specifications.
 - 2. Maximum aggregate size shall be 3/4" Medium.
- C. Aggregate base shall conform to Class 2 gradation and quality requirements, as specified in Section 26 of the 2010 Caltrans Standard Specifications.
- D. Asphaltic emulsion for paint binder, fog coat, and seal coat shall be emulsified asphalt, Type SS-1h, conforming to Section 94 of the Caltrans Standard Specifications
- E. Tack coat: Tack coat shall meet Caltrans Section 39-4.02.
- F. Metal edging shall be 0.210 inch (5.33 mm) thick extruded aluminum (6005) specifically designed for asphalt pavement restraint, natural mill finish, size as indicated on Drawings; as per "AsphaltEdge" by Permaloc (www.permaloc.com, 800.356.9660), or acceptable equivalent.
 - 1. Edging accessories, as per Drawings and recommended by edging manufacturer.
 - 2. Anchoring: 3/8 inch x 10 inches (9.5 mm x 254 mm) bright spiral steel spike. Use plastic washers where recommended by manufacturer.

2.02 EQUIPMENT

- A. Spreading Equipment: In accordance with the requirements Section 212.07 of the DPW Standard Specifications.
- B. Compacting Equipment: In accordance with the requirements of Section 212.09 of the DPW Standard Specifications

PART 3 - EXECUTION**3.01 PREPARATION**

- A. Subgrade: The upper 6 inches of subgrade shall be scarified, moisture conditioned and compacted to 95 percent.
- B. Class 2 aggregate base shall be placed, spread and compacted to not less than 95% relative compaction in conformance with Section 26 of the Caltrans Standard Specifications
- C. The Contractor shall be responsible for referencing surface structures prior to paving and locating them after paving operations are complete. Access to existing valves, manholes and vaults shall be provided at all times. The location of existing valves, manholes and vaults shall be staked and referenced during construction.
- D. The Contractor shall not proceed with paving work until given written approval from the City.

3.02 INSTALLATION

- A. General:
 - 1. Asphalt concrete shall be proportioned, mixed, placed, spread, and compacted in conformance with Section 39 of the CalTrans Standard Specifications.
 - 2. Before placing asphalt concrete, an asphalt emulsion tack coat shall be applied to all vertical surfaces of existing pavement, curbs, gutters, construction joints, and all existing pavement to be surfaced, in conformance with Section 39 of the CalTrans Standard Specifications.
 - 3. Spreading and compacting asphalt concrete shall be performed in accordance with Section 212 of the DPW Standard Specifications and/or Section 39 of the CalTrans Standard Specifications.
 - 4. Fog seal shall be applied to all finished surfaces of asphalt concrete pavement at a rate of 0.05 gallons per square yard, in accordance with Section 37 of the CalTrans Standard Specifications.
 - 5. After fog seal has been applied, ample time shall be allowed for drying before traffic is allowed on the pavement or paint striping is applied
- B. Conform Areas: In accordance with the requirements of Section 212.10 of the DPW Standard Specifications.
 - 1. Frames, grates and covers of all existing surface structures (manholes, vaults, valve boxes, drain inlets, monument boxes, etc.) shall be adjusted to finish grade within 48 hours of surface paving. Grade rings shall be supplied and installed by the Contractor as needed to meet finish grade.
 - 2. Frames of new or adjusted surface structures shall be supported by concrete.
 - 3. A structure located in an area paved with asphalt concrete shall not be constructed to final grade until the adjacent pavement or surfacing has been completed
- C. Install metal edging per manufacturer's written specifications.

3.03 SURFACE CONDITIONS

- A. The Contractor shall examine the areas and conditions under which Work of this Section will be performed. Conditions detrimental to the timely and proper completion of the Work will be corrected. The Contractor shall not proceed until unsatisfactory conditions have been corrected

3.04 DUST ALLEVIATION AND CONTROL

- A. Contractor shall be responsible for and shall provide pollution and dust abatement and control measures satisfactorily during the course of the work.
- B. The Contractor shall utilize reclaimed water, or dust palliatives, if necessary for compliance with the City's Water Conservation Ordinance.

3.05 FIELD QUALITY CONTROL

- A. The surface of finished base material shall vary by no more than 0.05 feet above or below the grade established in the plans or as directed by the Landscape Architect.
- B. The finished asphalt pavement, where not controlled by adjacent structures or features, shall not vary more than 0.05 feet above the planned grade, and not at all below, and shall be uniform and free of sharp breaks.
- C. The cross section of the finished pavement shall be free of ridges and valleys and shall not vary more than 0.03 feet above or below the theoretical section at any point on the cross section.
- D. The specified thickness of the finished pavement shall be the minimum acceptable.
- E. Conforms shall form a smooth, pond free, transition between existing and new pavement. Depressions in paving between high points are not to exceed 1/8 inch when measured below 10 feet long straight edged placed anywhere on the surface in any direction.
- F. The Contractor may be required to perform water tests to satisfactorily demonstrate the proper drainage of the constructed asphalt pavement.
 - 1. The Contractor shall make corrections necessary to demonstrate proper drainage with no ponding

3.06 CLEANUP AND PROTECTION

- A. During paving operations, keep adjacent areas and construction clean and work area in an orderly condition.
- B. Satisfactorily restore any existing improvements, paving, landscaping, and utilities disturbed during the course of constructing the improvements.
- C. Surplus materials and construction debris remaining upon completion of the work shall become the property of the Contractor unless otherwise specified herein or noted on the plans, and shall be removed from the work site by the Contractor and disposed of off-site in a lawful manner.
- D. Upon completion of paving work all paving shall be thoroughly cleaned of dirt, rubbish, debris and obstructions of any kind to the satisfaction of the Owner.
- E. Erect temporary fencing or barricades and warning signs, as required to protect newly paved areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after paving has stabilized.

END OF SECTION

SECTION 32 18 00**CONCRETE FLATWORK AND SITEWORK****PART 1 - GENERAL****1.01 SUMMARY**

- A. Work Included: Provide site concrete for pedestrian pavements, walls, curbs, and footings, complete, as shown and as specified in landscape drawings, including but not limited to:
 - 1. Concrete stairs (including warning strip)
 - 2. Concrete pavement
 - 3. Concrete base and footings.
- B. Related Work:
 - 1. Section 12 93 00 - Site Furnishings and Features
 - 2. Section 32 12 16 – Asphalt Concrete Pavement
 - 3. Section 32 91 13 - Soil Preparation

1.02 REFERENCES

- A. State of California, Business and Transportation Agency, Department of Transportation (CalTrans) "Standard Specifications" (CSS).
- B. ASTM - American Society for Testing and Materials
- C. ACI - American Concrete Institute, Manual of Concrete Practice, including but not limited to:
 - 1. ACI 301, "Specifications for Structural Concrete for Buildings."
 - 2. ACI 304: "Recommended Practice for Measuring, Mixing, and Placing Concrete."
 - 3. ACI 308: "Standard Practice for Curing Concrete."
 - 4. ACI 318, "Building Code Requirements for Reinforced Concrete."
- D. CB Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- E. CBC – California Building Code

1.03 QUALITY ASSURANCE

- A. Field-Constructed Mock-up: Prior to installation of concrete pavement and walls, erect mock-ups for each type of pavement and a full height and width wall section required to verify selections made under sample submittals. Build mock-ups to comply with the following requirements, using materials and same base construction including special features for flashing, expansion joints and contiguous work as indicated for final unit of work.
 - 1. Locate mock-ups on site, in place, where indicated or as directed by the Owner or Landscape Architect.
 - 2. Provide mockups to serve as the standard of quality for all work; include jointing, edge conditions and adjacent concrete work.
 - a. Pavement panel - 3 ft. x 3 ft. full depth, each finish.
 - 3. No pavement work shall begin until the samples and mockups have been approved by the Landscape Architect and becomes the standard of comparison for all respective work.
 - 4. Retain mock-ups during construction. Do not alter, move or destroy section until the work is completed. When directed, demolish mock-ups and remove from site.

5. Mock-ups may be incorporated as part of Work if conforming to specified requirements, and if accepted by the Landscape Architect.
- B. Contractor shall arrange and pay for concrete tests to be made by an independent testing laboratory acceptable to the Landscape Architect. Laboratory shall take, prepare, and cure samples, and do all field and laboratory testing. Promptly submit five copies of test reports to the Landscape Architect. Testing shall comply with ASTM C94-90.
1. Strength Tests: Strength tests shall be made from each 100 cubic yards of concrete or fraction thereof each day. For each test, three cylinders shall be molded, one to be used for a 7-day test.
 2. Air Content and Slump Tests: At the time samples are taken for strength tests, the laboratory shall make slump and air content tests.
 3. Coefficient of Friction: Friction tests shall be made from samples that have been approved for color, joints and finish. Friction test shall conform with the City of San Francisco's latest requirements for measuring slip resistance in the public right-of-way.
 4. Should tests show that concrete is below specified strength or coefficient of friction, Contractor shall remove all such concrete off the site. Full costs of removal of rejected concrete, its replacement with concrete of specified strength, and retesting shall be borne by the Contractor.
- C. Lines and Levels: To be established by a licensed Surveyor or registered Civil Engineer.
- D. Design of Concrete Mix: Employ approved commercial testing laboratory to design concrete mixes as follows:
1. Minimum Compressive Strength at 28 Days:
 - a. Slabs on structure: 2,500 psi
 - b. Slabs on Grade: 2,500 psi
 - c. Subbase Headers and Curbs: 3,000 psi
 - d. Vehicular Concrete: 4500 psi
 - e. Walls, Footings and Foundations: 4,500 psi
 - f. Concrete Slump shall meet the requirements of ACI 117:
 - 1) Minimum: Two (2) inches
 - 2) Maximum: Four (4) inches
 2. Cement Content for Slabs: Not less than those indicated in ACI 301
- E. Slip Resistance: All cast-in-place concrete to meet a slip resistance coefficient of 0.5 for flat surfaces and 0.8 for ramps
- F. Glare-Reduced Concrete: Add necessary proportion of accepted colorant at the mixer. Use identical proportions in batches for adjacent pours.
- G. Adjustment to Concrete Mixes: Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to the Owner. New field data, data from new trial mixtures, or evidence that indicates that the change will not adversely affect the relevant properties of the concrete shall be submitted for acceptance before use.

1.04 SUBMITTALS

- A. Product Data: Manufacturers' current catalog cuts and specifications for the following:
1. Glare reducing agent.
 2. Air-entrainment.

3. Curing compound.
 4. Expansion joint filler, sealant, backer rod and bond breaker.
 5. Joint sealant
 6. Stair warning strip
- B. Samples. Contractor shall provide samples until color and finish have been approved by the Landscape Architect. Furnish samples of the following:
1. Coarse aggregate: two 1-quart samples
 2. Joint Sealant: Including color chart.
 3. Stair warning strip: two pieces, 6-inch lengths
- C. Certificates:
1. Reinforcing steel: Certificate of compliance
 2. Concrete mix design: Ticket for each batch delivered showing the following:
 - a. Mix identification.
 - b. Weight of cement, aggregate, water, and admixtures, aggregate sizes/proportion, and air entrainment.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packaging and Labeling: Furnish materials in manufacturer's unopened, original packaging, bearing original labels showing quantity, description and name of manufacturer. Verify that all materials and components are adequately padded and securely bound in such a manner that no damage occurs to the product during delivery and unloading at the site.
- B. Do not deliver items until site conditions are adequate to receive the work. Protect items from weather while in transit, and against moisture and abrasion after delivery.
- C. Storage: Protect materials from weather. Store materials a minimum of 6 inches above ground on framework or blocking and protect with waterproof covering allowing for adequate air circulation and ventilation. Do not store materials in damp portions of building.
- D. Delivered Mixes: Coordinate delivery so that mixes may be immediately poured upon arrival at site.
- E. Components and Accessories:
1. Fittings and Reinforcements: Protect from rust, soil and oil contamination at all times. Store on pallets above ground.
 2. Templates: Protect from damage. Test accuracy prior to each use.

1.06 PROJECT/SITE CONDITIONS

- A. Existing Conditions: Protect all existing waterproofing during formwork and concrete pours on top and adjacent to walls, structural slabs and other improvements.
- B. Water and Dust Control: Maintain control of concrete dust and water at all times. Do not permit adjacent planting areas to be contaminated. Clean up all debris resulting from this work at the end of each day's work.

1.07 SEQUENCING AND SCHEDULING

- A. Coordination: Coordinate all items of other trades to be furnished and set in place. Coordinate proper installation of all accessories embedded in the concrete and for the provision of holes, openings, etc., necessary to the execution of the work of the trades in ample time that progress of the work is not delayed.

- B. Cutting/Patching: Perform as necessary to comply with above injunction.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cement:
1. ASTM C150, Type I or II Portland Cement. .
 2. The cement shall be of the same brand and type and from the same plant of manufacture as the cement used in the concrete represented by the submitted field test records or used in the trial mixtures.
- B. Coarse Aggregate:
1. Description: ASTM C33, hard, durable, uncoated, washed, graded, cleaned and screened crushed rock or gravel aggregate for regular weight concrete. Do not use crusher-run stone or bank-run gravel.
 2. Grading: Do not use aggregate which has a maximum size exceeding 1/5 of the narrowest dimension between sides of forms of the member for which the concrete is to be used, nor larger than 3/4 of the minimum clear spacing between reinforcing bars. Do not use coarse aggregate which exceeds 3/4 in. for paving.
 3. Coarse aggregate for white concrete should consist of clean, hard, durable white or light-colored aggregate, free from deleterious substances and organic impurities.
- C. Fine Aggregate:
1. Description: ASTM C33, clean, hard and durable sand. Do not use sand coated
 2. Grading Requirements:

Sieve Size	Percent Passing
No. 16 (1.19 mm)	45 - 70
No. 50 (0.297 mm)	15 - 30
No. 100 (0.149 mm)	3 - 8

- D. Water: Clean, potable concrete mixing water free from injurious amounts of salts, oils, acids, alkalis, organic materials or other deleterious matter. As available from Owner. Transport as required.

2.02 ADMIXTURE COMPONENTS

- A. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C494/C 494M, Type A.
 2. Retarding Admixture: ASTM C494/C494M, Type B.
 3. Air Entrainment: ASTM C260.
 4. Corrosion Inhibiting: ASTM C494, Type S

- B. Glare-Reducing Agent for Grey Concrete Sidewalks:
 - 1. Type: Liquid or semi-paste black colorant intended for use integrally in concrete mixes.
 - a. When using 10 to 40 ounces liquid measure per cubic yard of concrete, curing may be affected by the colorant used. Curing in this case shall be by the pigmented-curing compound method.
 - 2. Product: "Liquiblack" by Concrete Chemicals (www.liquiblack.com, 888.867.5701).
 - 3. Design Mix: One pint (approximately equal to one pound) per cubic yard, or per manufacturer's recommendations. Final mix proportions shall conform with approved samples and/or mockups.

2.03 ACCESSORIES

- A. Reinforcements:
 - 1. Reinforcing bars: ASTM A615 Grade 40, or 60 deformed billet-steel bars, clean and free from rust, scale, or coating that will reduce bond.
 - 2. Smooth dowels for expansion joints: ASTM A615, Grade 40 smooth, billet-steel bars, shop painted with iron-oxide zinc-chromate primer.
 - 3. Tie wires: 18 ga. min. black annealed.
 - 4. Snap ties: Snap-off metal of fixed length capable of leaving no metal within 1 1/2 in. of surface nor causing fractures, spall or other defects larger than one (1) in. diameter.
- B. Expansion joint materials:
 - 1. Premolded joint filler: ASTM D1751, non-extruding and bituminous type resilient filler, compatible with sealant, and having a "guide strip" removable depth gauge.
 - 2. Joint sealant: ASTM C290, "Sonolastic SL2" by Sonneborn, (www.buildingsystems.basf.com, 800.433.9517). Color to match adjacent paving.
 - 3. Bond Breaker: Pressure-sensitive tape as recommended by sealant manufacturer to suit application.
- C. Forms:
 - 1. Steel or wood of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal.
 - 2. Use forms that are straight and free of distortions and defects.
 - 3. Use flexible spring forms or laminated boards to form radius bends as required.
- D. Form release agent: Colorless non-staining, free from oils. Chemical agent shall not impair bonding of paint or other proposed coatings
- E. Form-facing materials:
 - 1. All Surfaces: Of sufficient strength to hold concrete properly in place and prevent leakage of water from forms.
 - 2. Exposed Vertical Surfaces: A-Matte, Two-step MDO plywood made for concrete forming. No wood-textured finish will be permitted on exposed concrete unless specified as such.
- F. Curing materials:
 - 1. Curing Compound: ASTM C309, Type I-D, Class A.
 - 2. Curing materials including liquid curing compounds or coverings shall be selected to be non-staining. The curing method selected must be tested for color impact on the surface of the concrete.
- G. Stair Warning (Nosing) Strip

1. Stair warning strip shall be single component, extruded aluminum (ASTM B 221, alloy 6063-T5) with an embedded abrasive of two part epoxy combined with aluminum oxide grit, as per Model #H-225 manufactured by Balco Inc (www.balcousa.com, 800.767.0082) or acceptable equivalent.

2.04 AGGREGATE BASE

- A. Aggregate base shall be hard, durable particles of stone, gravel or other finely divided mineral matter to produce a dense, compacted base.
- B. Base course aggregate shall be uniformly graded from coarse to fine and shall be as per CALTrans Class 2 aggregate and the following:

Screen Size	Percent Passing by Weight
1" (25 mm)	100
3/4" (19 mm)	90 – 100
No. 4 (4.75 mm)	35 – 60
No. 30 (0.595 mm)	10 – 30
No. 200 (0.074 mm)	2 – 9

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 1. Verify that subgrade preparation for concrete work has been completed including base course in conformance with the Geotechnical report recommendations, per Section 01 11 11 – Soil Investigation Data prior to commencement of work.
 2. Verify that the waterproofing, drain board, protection board, and structural slab drains have been installed by others and accepted by Architect.
- B. Surface Drainage:
 1. Report in writing conflicts discovered on the site or prior work done by others, which would prevent positive drainage.
 2. Do not permit finished paving surfaces to vary more than 1/4 in. measured with a 10 ft. metal straightedge, except at grade changes. No "birdbaths" or other surface irregularities will be permitted. Properly correct irregularities.

3.02 PREPARATION

- A. Templates: Use templates for all anchor plates, bolts, inserts and other items embedded in concrete. Accurately secure so that they will not be displaced during placing of concrete.
- B. Piping and Conduit: Do not embed piping, other than electrical conduit, in structural concrete. Locate conduit to maintain strength of structures at maximum. Verify size, length and location of electrical conduit.

- C. Aggregate Base Course: Compact base course to thicknesses shown on Drawings to 95% compaction.

3.03 INSTALLATION

- A. Formwork:
 - 1. Footings:
 - a. Prepare subgrades per conditions identified in drawings.
 - b. Coordinate work with other trades.
 - c. Verify all grades and subgrades and work by others.
 - d. Verify all steel reinforcing have met steel schedule and spacing per drawings and local codes.
 - 2. Construct forms accurately to dimensions, plumb and true to line and grade. Brace and tie as required to maintain position and shape during placing of reinforcing and concrete.
 - 3. Wavy surfaces and bulged slab surfaces in finished work will be rejected.
 - 4. Extend wood forms for all exposed concrete at least 6 in. below finish grade.
 - 5. Do not disturb earth at bottoms of excavations for footings or foundations. Maintain these areas free of water, properly cleaned and leveled off.
 - 6. Assemble forms so that all construction joints appear only as shown on Drawings and as accepted by Landscape Architect. Incorporate all formwork joints into required reveal and expansion joints. No exposed form joints will be permitted.
 - 7. Thoroughly clean all formwork prior to pouring concrete. Where no form coating is used, wet down all wood.
- B. Reinforcements:
 - 1. Placement: Clean, bend and place reinforcements per ACI Manual of Concrete Practice. Do not extend bars through expansion joints.
 - 2. Supports: Accurately and securely fasten or support reinforcements to prevent displacement before or during pouring. Hang footing bars from forms. Support wire mesh with suitable metal cradles.
 - 3. Reinforcement Splices: Reinforcing bars - 24 bar diameter minimum, except as otherwise noted.
 - a. Notify Landscape Architect 48 hours prior to pour.
 - b. Place concrete in conformance to the ACI Manual of Concrete Practice.
- C. Placing:
 - 1. Field Inspection: Do not place concrete until forms and reinforcing steel have been inspected and approved.
 - 2. Concrete slabs for pavement shall be formed, placed, vibrated, and finished by hand using conventional methods. Concrete bands/curbs, and footings shall be constructed in the same manner.
 - 3. Place concrete on moistened subgrade monolithically between construction joints. Deposit to full depth in one operation. Consolidate immediately. After depositing concrete, screed and darby or bullfloat.
 - 4. Deposit concrete continuously or in layers of such thickness that concrete will not be placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness.

5. Consolidate concrete placed in forms by high frequency mechanical vibrating equipment, supplemented as necessary by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
 6. Deposit and consolidate concrete slabs in continuous operation, within limits of construction joints, until placement of panel or section is completed. Maintain reinforcing in proper position during concrete placement operations.
 7. Placing Concrete Sidewalks: Place concrete in forms in one (1) layer of such thickness that when consolidated and finished, sidewalks will be of thickness indicated.
 8. Install stair warning (nosing) strip per manufacturer's written specifications. Set strip 1" from leading edge of each stair tread for the full width of the stair, inset 2" from each end.
- D. Removal of Forms:
1. Remove no sooner than at seven (7) days after each pour.
- E. Cleaning:
1. Removal: Remove all projecting fins, bolts, wire, nails, etc., not necessary for the work, or cut them back 1 in. from the surface and patch in an inconspicuous manner.
 2. Snap Ties: Immediately after removal of forms, cut off snap ties extending from the face of concrete to at least 1 in. deep in the concrete. Fill or plug as detailed in Drawings.
- F. Defective Work: Remove in its entirety and replace all defective concrete work which after corrective patching, rubbing, etc., fails to duplicate the appearance of unpatched work and/or conform to the standards set forth in these Specifications and the reviewed mock-up.

3.04 FINISHES

- A. Finishes, General:
1. Comply with ACI 302.1R for screeding, re-straightening and finishing operations for concrete surfaces. Do not wet concrete surfaces.
 2. Screed level all surfaces with a wood float.
 3. Do not screed surfaces until the surfaces have become stiff enough to withstand the pull without cracking.
 4. Architectural Finish: Patch tie holes and defects, and remove fins. Produce architectural finishes as specified
- B. Provide architectural finishes for all exposed surfaces, per the Drawings and reviewed mock-ups.
1. Concrete pavement: light broom finish
 2. Concrete stairs: light sandblast
- C. Broom Finish (concrete paving on grade)
1. Obtain by drawing a stiff bristled broom across a floated finish.
 2. Direction of brooming to be perpendicular to direction of paving, or as shown on Drawings.
- D. Sand-Blast Finish:
1. Conform to applicable regulations regarding abrasive blasting operations.
 2. Time Restriction: Perform sand blasting no sooner than 21 days after pouring each section of concrete.

3. Continuity: Perform in as continuous an operation as possible, utilizing the same work crew to maintain continuity of finish.
4. Depth of Cut: Use an abrasive grit of the proper type and gradation to expose the aggregate and surrounding matrix surfaces to match a medium cut, approximately 1/16 in. to 1/8 in. depth.
5. Backup Boards: Using backup boards to maintain a uniform corner or edge line.
6. Uniformity: Use same nozzle, nozzle pressure and blasting technique as used for sample panel.
7. Control: Maintain control of abrasive grit and concrete dust in each area of blasting.
8. Clean Up: Remove all expended abrasive grit, concrete dust and debris at the end of each day of blasting operations.

3.05 JOINTS (flatwork)

- A. Expansion Joints:
 1. Locations: Provide joints at locations and intervals shown on the Drawings, and where concrete paving abuts buildings, curbs, or other structures.
 2. Placement: Place joint materials with top edge 1/2 in. below the paved surface. Securely hold in place to prevent movement.
 3. Forming: Form joints and other edges in the fresh concrete using an edging tool to provide a smooth uniform impression. Strike all edges before and after brooming.
 4. Sealing: After the curing period, carefully clean expansion joints and fill with joint compound to 1/4 in. below adjacent paved surface. Do not permit spillage on paved surfaces or overflow from joint.
- B. Score Joints, hand tooled:
 1. Form in fresh concrete using a jointer to cut the groove so that a smooth uniform impression is obtained. Strike all joints before and after finishing.
 2. Perform in a continuous manner, avoiding misalignment. Redo all crooked or misaligned joints at no cost to Owner.

3.06 TOLERANCES

- A. Do not permit finished pavement surfaces to vary more than 1/4 in. measured with a 10 ft. metal straightedge, except at grade changes.
- B. No "birdbaths" or other surface irregularities will be permitted. Correct irregularities to the satisfaction of Landscape Architect.

3.07 PROTECTION AND CURING

- A. Protection:
 1. Protect concrete against rapid drying and damage by rain (frost).
 2. Keep concrete moist for at least 7 days. Protect with liquid curing compound, or a covering that will not stain or discolor finished concrete surfaces. Obtain acceptance of proposed method prior to use.
- B. Spraying: Spray concrete during the curing period as frequently as drying conditions may require.
- C. Curing: Cure concrete in accordance with the ACI Manual of Concrete Practice. During curing period, maintain concrete above 70 degrees F. for at least 3 days or above 50 degrees F. for at least 5 days.

- D. Damage and Defacement: Protect all concrete work against damage and defacement during subsequent construction operations until final acceptance.

3.08 FIELD QUALITY CONTROL

- A. Samples: Owner will select a qualified testing laboratory to take samples for testing during the course of the work as considered necessary.
- B. Rejected Materials: Remove off the site all concrete below specified strength.
- C. Cost of Removal and Retesting: Pay for full costs of removal of rejected concrete and its replacement with concrete of specified strength and retesting.

END OF SECTION

SECTION 32 84 00**IRRIGATION (DESIGN BUILD)****PART 1 - GENERAL****1.01 SUMMARY**

- A. Section Includes (but Not Necessarily Limited to):
 - 1. Designing, furnishing, installing and testing complete design-built automatic, low flow irrigation system.
 - 2. Should utilize the existing irrigation system wherever feasible
 - 3. Maintenance Period.
 - 4. Preparation of As-Built Drawings and Operations Manual.
 - 5. Tests.
 - 6. Warranty
 - 7. Preparation and submittal of water use calculations and forms as required by City and State regulations
- B. Related work specified elsewhere:
 - 1. Section 32 32 19 – Seeded Turf.
 - 2. Section 32 93 00 - Planting.

1.02 RELATED SECTIONS

- A. Section 32 90 00 - Planting.
- B. Division 26 - Electrical.

1.03 SUBMITTALS

- A. Irrigation Design Plan: At least 10 days prior to beginning work, submit an irrigation plan (plan) documenting all proposed irrigation work and equipment. The irrigation plan is to be drafted electronically using an electronic copy of the site base plan. The submitted plan is to reflect the following items of Design Intent:
 - 1. Full coverage of all proposed plants.
 - 2. Water conservation standard practices.
 - 3. Compliance with applicable water efficient landscape codes and ordinances.
 - 4. Compliance with industry standard best management practices including, but not limited to, sprinklers type, layout and spread adjusted to water the landscape, without overspray onto adjacent hardscape.
 - 5. All proposed equipment is of commercial grade, high quality and high durability.
 - 6. Watering methods and equipment are appropriate to type of plants.
- B. At least 10 days prior to beginning work, submit five copies of catalog cuts of equipment and accessories proposed for installation. Quantities need not be shown
- C. Submit a proposed work schedule indicating when required inspections will be scheduled.
- D. Make all submittals at one time. No submittals will be reviewed until the entire package has been provided for review.

1.04 QUALITY ASSURANCE

- A. All work and materials to be in full accordance with latest rules and regulations of the Division of Industrial Safety; the Uniform Plumbing code; National Electric Code; Americans with Disabilities Act, and other applicable laws or regulations, including all local codes.
 - 1. Work and materials shall conform with the current edition of the San Francisco Recreation and Park Department (SFRPD) Irrigation Standards. The SFRPD standards shall supersede any conflict with this specification section.
- B. Nothing in these drawings or specifications is to be construed to permit work not conforming to these codes.
- C. Furnish, without extra charge, any additional material and labor as required to comply with these rules and regulations, though the work is not mentioned in these particular Construction Documents.
- D. Work of this section is to be supervised and completed by experienced personnel.

1.05 PROTECTION AND REPAIR OF EXISTING CONDITIONS

- A. Become acquainted with all site conditions. Locate existing utilities and equipment to remain. Should utilities or other work not shown on the plans be found during excavation, promptly notify Owner's Representative. Failure to do so will make Contractor liable for any and all damage arising from his operations subsequent to discovery of such utilities not shown on plans.
- B. Limit of work for irrigation includes all areas to receive new plants. All other site existing landscaping is to remain. Protect existing irrigation in place and maintain operation during construction.
- C. Within limit of work, inspect and document needed irrigation system repairs for landscape areas where no new planting is proposed. Make repairs as required to restore irrigation in these areas and connect to automatic system.
- D. Before starting work of this section report to the Owner's Representative, in writing, conditions which will prevent the proper provision of this work. Beginning the work of this Section without reporting unsuitable conditions to the Owner's Representative, constitutes acceptance of conditions. Any required removal, repair, or replacement of this work caused by unsuitable conditions to be done at no additional cost to the Owner.
- E. Take necessary precautions to protect existing site conditions. Repair any damaged item to its original condition or furnish and install equivalent replacement at no additional cost to the Owner.

1.06 COORDINATION

- A. Schedule and coordinate work with other trades to avoid conflicts in construction sequence and equipment installation.
- B. Prior to beginning work of this section, verify that all sleeves, conduits, penetrations, etc. to be installed by other trades are in place and installed correctly. Report any unsuitable condition to the Owner's Representative.

1.07 PRODUCT HANDLING

- A. Protect work and materials under this Section from damage during construction and storage. Protect polyvinyl chloride (PVC) pipe and fittings from direct sunlight. Beds on which pipe is stored must be full length of pipe.

1.08 AS-BUILT DRAWINGS

- A. Keep construction drawings on the job site at all times. Make daily record of work installed each day.
- B. After all work is complete have a set of As-Built Drawings prepared, by a competent draftsman, on a reproducible copy of the irrigation plan. As-Built Drawings shall show all deviations from the Contract Documents. Show locations of underground equipment by dimensioning off known points of reference. Indicate material substitutions in legend. Include manufacturer name, catalog number and size.
- C. Completed As-Built Drawings shall be delivered to Owner's Representative prior to final acceptance.

1.09 CLEAN-UP

- A. Keep all areas of work clean, neat and orderly at all times. Clean up and remove all debris from the work area prior to Final Acceptance.

1.10 FINAL ACCEPTANCE

- A. Work under this Section will be accepted by Owner's Representative upon satisfactory completion of all work.

1.11 MAINTENANCE PERIOD

- A. The Maintenance Period begins after all work is complete as determined by Owner's Representative, and runs concurrently with the Plant Maintenance Period. Maintenance shall be by qualified and experienced personnel and includes, but is not limited to, operating, flushing and adjusting the irrigation system to assure complete coverage, minimum overthrow and adequate watering. Drip zones are to be flushed and emitter flow checked at a minimum of once per week.
- B. Maintenance Period may be extended by the Owner's Representative if the system is improperly maintained.

1.12 WARRANTY

- A. In addition to manufacturer's warranties, all work shall be warranted for one year from date of Final Acceptance against defects in material, equipment and workmanship. Warranty shall also cover repair of damage to any part of the premises resulting from leaks or other defects in materials, equipment and workmanship to the satisfaction of the Owner.

PART 2 - PRODUCTS**2.01 GENERAL**

- A. Provide new products in perfect condition.

- B. Provide equipment as shown on drawings and as specified herein. Any substitution must be approved by Owner's Representative.
- C. The SFRPD Irrigation Standards shall supersede all materials specified herein that may be in conflict with those standards.

2.02 CONTROLLER

- A. Provide controllers of sufficient station capacity to accommodate all control valves in new or renovated landscape areas, as well as all existing control valves that are to remain.
- B. "Smart" controller, capable of daily schedule adjustment based on one or more of the following methods:
 - 1. On-site climate/weather sensor.
 - 2. On-site soil moisture sensor(s).
 - 3. Remote weather data service.
- C. Remote Control: Provide (1) hand-held remote control kit, compatible with controller.
- D. Weather or Soil Moisture Sensor: Manufacturer to be same as controller

2.03 REMOTE CONTROL VALVES

- A. Commercial grade. Plastic or glass-filled nylon body & bonnet, flow control, manual bleed valve. Valve to be serviceable without removing valve body from pipeline. Toro, Rainbird, Hunter manufacturers or equivalent.

2.04 GATE VALVES

- A. Bronze gate valve with 200 PSI WOG/125 PSI SWP; screw-in bonnet, non-rising stem; solid wedge conforming to MSS SP 80; Nibco T113 K, Hammond or equivalent.

2.05 QUICK COUPLING VALVES

- A. Provide with purple cap, bearing industry standard language for recycled water use. Size 1"

2.06 IRRIGATION HEADS

- A. Bubbler heads to be pressure compensating type.

2.07 DRIP & SUBSURFACE IRRIGATION

- A. All new irrigation for proposed planting areas is to be low volume drip or subsurface, using commercial grade equipment as approved.
- B. Drip irrigation: Pressure compensating emitters with 1/2" IPS flexible PVC hose and solvent weld fittings.
- C. Subsurface irrigation: Pressure compensating with root intrusion protection. Tubing and fittings to be by same manufacturer.
- D. No multi-outlet emitters or small diameter "spaghetti" distribution tubing is to be used.

2.08 PIPE

- A. Mainline: PVC Schedule 40, conforming to ASTM D-1784, D-1785.
- B. Lateral Pipe: Class 200 PVC, conforming to ASTM D2241, D-1784.
- C. Plastic Pipe and Fittings Identifications. Pipe to bear the following markings:

1. Manufacturer's name
2. Nominal pipe size
3. Schedule of class
4. Pressure rating psi
5. NSF (National Sanitation Foundation) seal of approval
6. Date of extrusion

2.09 FITTINGS & NIPPLES

- A. PVC solvent weld fittings: Standard weight, Schedule 40, injection molded PVC. Comply with ASTM – D17854, cell classification 1345B. Threads, where required, injection molded type. Tees and ells: side gated. Threaded nipples: Standard weight, Schedule 80 with molded threads. All fittings exposed to sunlight, such as at the end of flexible riser assemblies, are to be Schedule 80 PVC.
- B. Flexible riser assemblies: I.P.S. flexible Schedule 40 solvent weld PVC hose, and shall conform to ASTM D2241, D1784; with Schedule 40 PVC solvent weld fittings.
- C. Anchorages: Clamps, straps and washers: steel, ASTM A506; bolts: steel, ASTM A307.

2.10 FITTING COMPOUNDS, SOLVENTS & WRAPS

- A. Primer and cement: As recommended by manufacturer of pipe being installed.
- B. Thread sealant: Non-hardening sealant compatible with pipe being installed. PVC pipe: Christy's Teflon paste or equivalent on constant pressure (mainline) threaded connections. Do not use thread lubricant on PVC pipe. Galvanized, brass or copper pipe: RectorSeal No. 5.
- C. Teflon tape: for PVC male threads on non-pressurized (lateral line) threaded connectors only.

2.11 WIRE

- A. 600v UF, 14 gauge minimum solid conductor with PVC insulating jacket. Common wire insulation to be white. Control wire insulation to be black or red. Spare wire insulation to be yellow.
- B. Splicing materials: Make water proof splices, where permitted, using splice kit specifically for underground applications.

2.12 VALVE BOXES

- A. Furnish all valve boxes with locking bolts.
- B. General landscape: Glass filled plastic, commercial grade, sized to accommodate each type of irrigation component. Carson, NDS, or approved equivalent, color black.
- C. Where installed in sidewalk or high traffic areas, reinforced concrete with locking lid of cast iron or steel. Christy, NDS, or approved equivalent.

2.13 KEYS

- A. Provide two sets for controller cabinet, for quick coupling valves provide four keys and four matching hose swivels.

2.14 CHECK VALVES

- A. Adjustable spring type with molded Schedule 80 PVC body and stainless steel spring. Hunter HCV series, KBI CV series or approved equivalent.

PART 3 - EXECUTION**3.01 IRRIGATION DESIGN PLAN**

- A. The Irrigation Design Plan (Plan) must conform to the design intent described in paragraph 1.03 A of this section.
- B. At a minimum, indicate all proposed irrigation circuits, automatic control valves, quick coupling valves, mainlines, isolation valves, sensors and controllers. The plan must include all information necessary to construct a complete and functional irrigation system. Include with the plan a legend of proposed equipment, and construction details.

3.02 PREPARATION

- A. Exercise care in excavation and working near existing utilities. Check existing utility locations.
- B. Do not proceed with work until unacceptable site conditions are corrected or existing utilities are located and/or marked out in field.
- C. Protection:
 - 1. Provide barricades, coverings, warning signs, lights and other protection required by local code or OSHA to protect the public and workers.
 - 2. Protect improvements on adjoining areas as well as those on the project site.
 - 3. Restore any improvements damaged by this work to original condition, as acceptable to Owner's Representative or other parties or authorities having jurisdiction.

3.03 LAYOUT

- A. Lay out work as accurately as possible to drawings using stakes and different colored flags to indicate different types of circuits and valves.
- B. Adjust layout as required to conform to existing site conditions and avoid conflict with trees, light standards and other site elements.

3.04 EXCAVATING AND TRENCHING

- A. Perform all excavations as required for installation of work included under this Section, including shoring of earth banks, if necessary. Restore to their original condition all surfaces and existing underground utilities damaged or cut as a result of the excavation.
- B. Dig trenches wide enough to allow a minimum of 4 inches between parallel irrigation pipe lines. Do not install pipe directly over other lines in same trench.
 - 1. Dig trenches of sufficient depth to provide minimum cover from finish grade as follows:
 - Mains: 18 inches
 - Laterals: 12 inches
 - Wire 18-24 inches (with main lines)

Pipe or wire under traffic loads: 24 inches, plus depth of roadway section

2. Install all pipe and wiring under paving in sleeve; except where runs under paving exceed 30 feet, install in bed of clean sand surrounding pipe 6 inches on all sides.

3.05 PIPELINE ASSEMBLY

- A. General:
 1. Install pipe in accordance with manufacturer's instructions and per ASTM D2774 and D2855.
 2. Place no closer than 4 inches to edge of paving and 12 inches to buildings, walls or fences.
 3. Where pipe of dissimilar metals are connected, use dielectric fittings.
- B. PVC Solvent Weld Pipe:
 1. Clean trenches of debris and level trench bottoms as required to support pipe evenly without dips.
 2. Solvent weld PVC pipe and fittings using materials and methods recommended by manufacturer. Clean pipe and fittings of dirt, burrs, and moisture before assembly. PVC pipe may be assembled on ground surface beside trench. Snake pipe from side to side in bottom of trench.
 3. Use pipe cutters to cut pipe or other method which does not result in burrs.
- C. PVC Threaded Pipe: Use thread sealant (not thread lubricant) on threaded PVC connections and assemble the joint. Do not over tighten. Do not apply thread sealant on female threads.

3.06 IRRIGATION HEADS

- A. Install all bubbler heads on a flexible swing joint assembly constructed with flexible PVC. Stake bubblers to plant root balls and cover with mulch.

3.07 DRIP & SUBSURFACE IRRIGATION

- A. Drip irrigation: Install minimum of two drip emitters at each plant.
- B. Subsurface irrigation: Uniform soil texture is critical to the success of subsurface irrigation. Do not install subsurface lines until all specified soil prep work has been completed and approved.
- C. For all drip or subsurface irrigation, install automatic flush valves and air/vacuum relief valves as recommended by manufacturer. Install these components in a 6" round valve box.
- D. All drip or subsurface irrigation is to be covered, and buried so as to be out of sight.

3.08 QUICK COUPLING VALVES

- A. Locate quick coupling valves 12 inches from adjacent remote control valves. If not located with remote control valves, install 12 inches maximum from edge of paving at accessible location.
- B. Locate such that all planting and paved surfaces can be reached with a 50 foot hose.
- C. Install with 24" long re-bar stabilizer rod and clamped by two stainless steel clamps.

3.09 REMOTE CONTROL VALVES

- A. Install new valve boxes for all remote control valves and gate valves.

- B. Install remote control valves in valve boxes and group boxes together where practical. Place 12 inches from paving edges, or 12 inches from buildings or walls. Install multiple valve boxes 12 inches apart.
- C. Install one remote control valve per valve box. Set valve boxes 1 inch above finish grade in shrub/groundcover areas.
- D. Prior to backfilling wrap valve boxes with filter fabric, covering holes in box sides. No filter fabric shall be visible after backfilling.
- E. Fill bottom of valve box with 4-inch depth $\frac{3}{4}$ -inch drain rock. Do not bury valve or wiring connections.
- F. Label each valve with polyurethane I.D. tag attached to valve wire. Christy Standard Tag, or equivalent.

3.10 CONTROLLER

- A. Install per manufacturer's instructions and local code.
- B. Ground controller.
- C. Prepare two copies of controller chart from reduced copy of irrigation plan. Indicate area covered by each zone using non-fading color pens. Laminate controller charts and place one copy in irrigation controller cabinet. Include second copy in Operations Manual.
- D. Install weather or soil moisture sensor per manufacturer's recommendations. Obtain approval of owner's representative for sensor location prior to installation.

3.11 GATE VALVE

- A. Install in valve box with extensions as required. Set valve box 1 inch above finish grade in shrub/groundcover areas. Fill bottom of valve box with 4-inch depth $\frac{3}{4}$ -inch drain rock. Do not bury valve.
- B. Provide Owner's Representative with any operating keys required for gate valves installed.

3.12 CONTROL WIRING

- A. Provide conduit sweeps into all valve boxes and pull boxes.
- B. Install decoders in valve boxes. Create expansion coils in valve wiring from decoders according to manufacturer's recommendations and make all splices with approved splice kits.
- C. Use a continuous two-wire path between controller and all lawn remote control valves. Do not splice wire at any point except as otherwise approved.
- D. Where splices are approved, make waterproof splice with specified splicing materials. All splices are to be in approved splice boxes.

3.13 CLOSING PIPES AND FLUSHING LINES

- A. Cap or plug all openings in pipe or fittings throughout installation to prevent entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.
- B. Thoroughly flush all main lines before installing remote control valves. Thoroughly flush all lateral lines before installing irrigation heads or subsurface irrigation.

3.14 BACKFILLING & COMPACTING

- A. After system is operating and required tests and observations have been made, backfill trenches with finely divided soil free of rubbish and rocks.
- B. Compact backfill for trenches to equal surrounding undisturbed soil.
- C. Dress off all areas to finish grades. Adjust grades if settlement occurs.

3.15 OBSERVATIONS & TESTS

- A. Submit written requests for observation meetings to Owner's Representative at least 3 days prior to meeting.
- B. Observation meetings to be called as the following work is completed:
 - 1. At the time of the mainline pressure test.
 - 2. When installation of the first drip irrigation zone is complete. Do not proceed with additional bubbler zones until this observation meeting is held.
 - 3. At the coverage test (pre-maintenance).
- C. Pressure tests:
 - 1. Provide all equipment necessary to test systems, including pump.
 - 2. Perform all hydrostatic tests in presence of Owner's Representative.
 - 3. Test all pressure supply lines under hydrostatic pressure of 125 PSI for a period of 2 hours unless otherwise accepted to show lines free of leaks and defects.
 - 4. Do not backfill over any line more than is necessary for testing until it has been inspected and tested, leave joints uncovered.
 - 5. Do not install remote control valves, quick couplers or any other valve assembly until testing is complete.

3.16 ADJUSTING

- A. Valves: Adjust flow for proper operation. Automatic valves should close fully within 15 seconds of deactivation by controller.
- B. Sprinklers: Adjust spray to water the landscape, without overspray onto adjacent hardscape.

3.17 DEMONSTRATION

- A. System layout: Provide reduced prints of As-Built Drawings plan and include in Operations Manual.
- B. Upon completion of work, instruct Owner's Representative in operation and maintenance procedures for entire system.
- C. Prepare and deliver to Owner's Representative an Operations Manual, in three-ring binder, to include the following: Manufacturer's data sheets, maintenance and parts information for each type of equipment installed; equipment warranties; copy of controller chart; and names and addresses of Contractor, sub-contractors and equipment suppliers.

END OF SECTION

SECTION 32 91 13**SOIL PREPARATION****PART 1 - GENERAL****1.01 SUMMARY**

- A. Work Included: Provide all soil and soil amendments products, and execute all labor to achieve soil preparation, complete, as shown and as specified including
 - 1. Amended planting soil for at grade planting
 - 2. Lawn planting mix
 - 3. Imported topsoil (as required to make up deficiencies in quantity of stockpiled topsoil available on site)
 - 4. Cultivation of all subgrade areas prior to amending.
- B. Related Work:
 - 1. Section 32 01 90 - Operation and Maintenance of Planting
 - 2. Section 32 84 00 - Irrigation
 - 3. Section 32 91 19 – Finish Grading
 - 4. Section 32 92 19 – Seeded Turf
 - 5. Section 32 93 00 - Planting

1.02 SUBMITTALS

- A. Product Data: Manufacturer's current catalog cuts and specifications of the following:
 - 1. Organic compost
 - 2. Compost tea.
 - 3. Filter Fabric
 - 4. Herbicide
 - 5. Organic and inorganic amendments utilized
 - 6. Organic enzymatic fertilizer compound
 - 7. Mycorrhizal inoculation
- B. Samples: Submit samples of the following:
 - 1. Soil mix: Two (2) 1-pint samples of each type
 - 2. Organic compost: Two (2) 1-pint samples
 - 3. Geotextile (Filter) Fabric: Two 12" square pieces.
- C. Quality Control Submittals:
 - 1. Testing Agency recommended for use:
 - a. Waypoint Analytical (formerly Soil and Plant Laboratory, Inc.), 1101 S. Winchester Blvd., Ste. G-173, San Jose, CA 95128, Tel. (408) 727-0330Root Zones Associates, P.O. Box 18911, San Jose, CA 95118, Tel. (408) 264-7024Wallace Laboratories, 365 Coral Circle, El Segundo, CA 90245 (310) 615-0116Test Reports:
 - a. All soil types: Test for agricultural suitability, contaminants and required amendments. Acceptability will be determined by soils testing laboratory.
 - Stockpiled and Imported Topsoil: Test for parasitic nematodes and herbicide contamination; agricultural suitability, contaminants and required amendments. Acceptability will be determined by soils testing laboratory.
 - Test amended soil after mixing with amendmentsCompost: Laboratory that performs testing shall be independent, enrolled in the US Composting Council's (USCC)

Compost Analysis Proficiency (CAP) program, and perform testing in accordance with USCC Test Method for The Examination of Composting and Compost (TMECC). The sample collection protocol can be obtained from the U.S. Composting Council, 4250 Veterans Memorial Highway, Suite 275, Holbrook, NY 11741, 631-737-4931, www.compostingcouncil.org Other tests as noted herein in this specification section. Certificates:

- a. Certify strict compliance with accepted soil mixes and amendments, including rate of application.
- b. Furnish a Certificate of Conformance with each delivery of material. Ensure that Certificate states source, quantity or weight, type and analysis, rate of application and date of delivery. Deliver all certificates to Owner's Representative.

1.03 PROJECT/SITE CONDITIONS

- A. Existing Conditions:
 1. If planting area has been treated with lime, remove all lime treated soils from site.
 2. Through study of all Contact Documents and by careful examination of the site, become informed as to the nature and location of the Work, the nature of surface and subsurface soil conditions, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the Work, the general and local conditions, and all other matters which can in any way affect the Work.
- B. Conform to all governmental regulations in regard to the transportation of materials to, from, and at the job site, and secure in advance such permits as may be necessary
- C. Should the Contractor, in the course of Work, find any discrepancies between Contract Documents and physical conditions or any omissions or errors in the Drawings it shall be the Contractor's duty to inform the Landscape Architect immediately in writing for clarification. Work done after such discovery, unless authorized by the Landscape Architect, shall be done at the Contractor's risk.
- D. Perform both off site mixing and on-site soil work only during suitable weather conditions. Do not disc, rototill, or work soil when frozen, excessively wet, or in otherwise unsatisfactory condition. Soil mixes shall not be handled, hauled, or placed during rain or wet weather or when wet near or above field capacity.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. Stockpiled Native Topsoil:
 1. Quantity: The approximate quantity of stockpiled native top-soil will not be known until demolition and rough grading have been completed.
 2. Stockpiling: Stripped topsoil shall be stockpiled on the site, location to be determined by the Owner.
 3. Composition: Fertile, friable, well-drained soil, of uniform quality, free of stones over 1 in. diameter, weeds and weed seeds, sticks, oils, chemicals, plaster, concrete and other deleterious materials.
 4. Analysis: Obtain an agricultural suitability analysis of the proposed topsoil from an accepted, accredited Testing Agency at Contractor's cost.

5. Test Results: Request Testing Agency to send one (1) copy of test results direct to the Architect and one (1) copy to the Owner. Imported and stockpiled topsoil shall be amended per soils analysis report.
 6. Rejected Topsoil: Immediately remove rejected topsoil off the site at Contractor's expense.
- B. Imported Topsoil:
1. Imported topsoil shall be provided if an insufficient quantity of stockpiled topsoil is verified. Quantity of topsoil to complete the work shall be calculated by the Contractor.
 - a. Imported topsoil shall match or exceed in quality specifications herein, or as determined by analysis. Stockpile on site as directed by Owner. Landscape Architect reserves the right to take samples of the imported topsoil delivered to the site for conformance to the Specifications. Immediately remove rejected topsoil off the site at Contractor's expense. Imported topsoil shall be fertile, natural soil, capable of sustaining healthy plant life. Free of stones and other objects over 2 inches in diameter, including subsoil and clay lumps. Without weeds, roots, noxious seeds, toxic substances, trash and other deleterious substances. Not infested with plant-parasitic nematodes or with other noxious animal life. oils, chemicals, plaster, concrete and other deleterious materials.
 3. Obtain import soil from well-drained, arable land. Identify the source of topsoil, for observation and review by the Owner's Representative prior to any hauling or placing of soil
 4. Texture: "Loam" or "Sandy Loam" as classified in accordance with USDA Standards. Soil must pass through a 2.0-mm sieve. Sand fraction with 85 percent falling in the medium to fine sand range. Silt and clay content shall not exceed that of the existing soil over which the import topsoil is to be placed.
 5. Fertility: Topsoil to contain sufficient quantities of organic matter and available nitrogen, phosphorus, potassium, calcium, and magnesium to support normal plant growth, as determined by soil testing and analysis specified herein. In the event of nutrient inadequacies, incorporate required materials prior to planting.
 6. Organic Matter content shall be a minimum of 5% and up to 10% organic matter by dry weight (with 20% or more compost content).
 7. Chemistry: Meet the following standards:
 - a. Salinity: Saturation extract conductivity (ECe) less than 3.0 mmhos/cm at 25 degrees C. Sodium: Sodium adsorption ratio (SAR) less than 6.0. Boron: Saturation extract concentration less than 1.0 ppm. pH: pH of saturated paste 5.5 to 7.5.
- Imported Fill:
1. Imported Fill, where required, shall be a non-expansive and predominantly granular soil or soil-rock mixture which is free from organic matter and deleterious substances, and which does not contain materials over 4" in greatest dimension.
 2. Material having a dimension greater than 2" shall not be used in the upper 6" of fill.
- D. Planting Backfill Mixture:
1. Existing site soil including topsoil and material excavated from planting pits shall NOT be used as a component of the planting backfill mixture.
 2. Mix 2" compost into top 6" of planting backfill mixture.
- E. Lawn Mix (Sand Bed Sub-base)
1. Gravel Base: Not more than 10% of the particles greater than 1/2". At least 65% of the particles between 1/4" and 3/8". Not more than 10% of the particles less than 2mm.

2. Intermediate Layer Material: At least 90% of the particles between 1mm and 4mm.
3. Sand Selection:

Name	Particle Diameter	Recommendation by Weight
Fine Gravel	2.0-3.4mm	Not more than 10% of the total particles in this range, including a maximum of 3% fine gravel. (Preferably none.)
Very Coarse Sand	1.0-2.0mm	Same.
Coarse Sand	0.5-1.0mm	Minimum of 60% of the particles must fall in this range
Medium Sand	0.25-0.50mm	.
Fine Sand	0.15-0.25mm	Not more than 20% of the particles may fall within this range.
Very Fine Sand	0.05-0.15mm	Not more than 5% of the total particles in this range
Silt	0.002-0.05mm	shall exceed 10%.
Clay	Less than 0.002mm	

4. Organic Matter Selection: Peat Moss 5% by weight of total root zone mix.
5. Physical Properties:
 - a. Total Porosity: 35%-55%
 - b. Air-filled Porosity @ 40cm tension 15%-30%
 - c. Capillary Porosity @ 40cm tension 15%-25%
 - d. Saturated Conductivity:
 - e. Normal Range 6-12 in/hr (15-30 cm/hr)
 - f. Accelerated Range 12-24 in/hr (30-60 cm/hr)
 - g. Organic Content by Weight 1%-5% (ideally 2%-4%)
 - h. Ratio of loose peat moss to soil by volume: 1 part peat to ten (10) parts soil.
 - i. Weight of lime necessary to result in specified soil pH according to soil test results by area.
 - j. Weight of commercial fertilizer per 1,000 sq. ft.: 5lbs./1,000 sq. ft.

2.02 ORGANIC COMPONENTS

- A. Compost:
 1. Type: Dark, rich, microbially active premium quality compost made from recycled yard trimmings vegetal food waste, forest or agricultural products, dairy manure, chicken manure, worm castings, bat guano, kelp meal or oyster shell. Containing no sludge or bio-solids.
 2. Compost shall be a finished humus; well decomposed, stable and weed free, and without significant odor; meeting US Compost Council STA/TMECC criteria or equal for Class I or II stable, mature product.
 3. Compost shall be "well-aged" meeting or exceeding USEPA Class A standard, 40 CFR 503.13 Tables 1 & 3 (chemical contaminants) and 40 CFR 503.32(a) (pathogens) and/or be permitted in the state of origin to produce Class A material.

4. It shall be derived from one or more locally sourced organic materials such as : food waste or urban plant debris, agricultural crop residue or herbivore animal manures with a preference for urban plant debris and food waste. It shall not contain mixed solid waste.
5. The product shall contain no substances toxic to plants, will possess no objectionable odors and shall not resemble the feedstock (the original material from which it was derived).
6. Compost Quality Analysis by Laboratory - Before delivery of the soil, the supplier shall submit a copy of lab analysis performed by a laboratory that is enrolled in the US Composting Council's Compost Analysis Proficiency (CAP) program and using approved Test Methods for the Examination of Composting and Compost (TMECC). The lab report shall verify:
 - a. Feedstock Materials shall be specified and include one or more of the following: landscape/yard trimmings, grass clippings, food scraps, and agricultural crop residues. Feedstock shall not include biosolids or manure. Organic Matter Content: 35% - 75% by dry wt. Carbon and Nitrogen Ratio: C:N < 25:1 and C:N > 15:1 Maturity/Stability: shall have a dark brown color and a soil-like odor. Compost exhibiting a sour or putrid smell, containing recognizable grass or leaves, or is hot (120F) upon delivery or rewetting is not acceptable. In addition, any one of the following is required to indicate stability: Specific Oxygen Uptake Rate (SOUR): 1.5 milligrams O₂ per gram biodegradable volatile solids per hour (maximum) per TMECC 05.08-A.
 - 2) "Carbon Dioxide Evolution Rate: 8 milligrams CO₂ per gram volatile solids per day per TMECC 05.08-B
 - 3) Dewar Self Heating Test 20° C Temp. rise (maximum) per TMECC 05.08-D (Class IV or V).
 - 4) Solvita® Index value greater than 6 per TMECC 05.08-E
 - e. Toxicity: Seed Germination: greater than 80 percent of control AND Vigor: greater than 80 percent of control per TMECC 05.05-A. Nutrient Content: provide analysis detailing nutrient content including N P K, Ca, Na, Mg, S, and B. Total Nitrogen content 0.9% or above preferred.
 - 2) Boron: Total shall be <80 ppm;
 - g. Salinity/Electrical Conductivity: less than 6.0 deciSiemen per meter (dS/m or mmhos/cm) per TMECC 04.10-A (1:5 Slurry Method, Mass Basis) pH shall be between 6.5 and 8 per TMECC 04.11-A (1:5 Slurry pH). Compost tea
 1. Compost tea is produced by soaking healthy compost in water using some method of aeration. Compost tea is brewed from compost and a microbial food source additive, such as molasses, kelp, rock dust, and humic-fulvic acids.
 2. Organic soil micro-organism / fertilizer liquid compound prepared specifically to replenish beneficial soil micro-organisms and processes for plant growth, as per "Soil ProVide", available from Earthfort (www.earthfort.com, 541.257.2612), or acceptable equivalent.
- C. Organic enzymatic fertilizer compound, in a fine powder composed of organic matter, humic acid and enzymes prepared specifically to help replenish soil health, as per "Soil ReVive", available from Earthfort (www.earthfort.com, 541.257.2612), or acceptable equivalent.

- D. Mycorrhizal inoculation containing minimum of 110 million propagules / pound; particle size less than 212 microns; with beneficial endo- and ectomycorrhizal species, including Trichoderma (300 million CFU / lb) and bacteria (6 billion CFU / lb); "MycoApply Soluble" available from Mycorrhizal Applications Inc. (541.476.3985) or acceptable equivalent.
- E. Manure:
 - 1. Type: Well-rotted cow, horse or sheep manure, free from sawdust, shavings or refuse.
 - 2. Straw Content: Maximum 25% straw by volume.

2.03 INORGANIC AMENDMENTS:

- A. Consult soils report for recommended amendments and rates, which may include the following:
 - 1. Ground Limestone: Agricultural limestone containing not less than 85% of total carbonates, ground to such fineness that 50% will pass #100 sieve and 90% will pass #20 sieve
 - 2. Dolomite Lime: Agricultural grade mineral soil conditioner containing 35% minimum magnesium carbonate and 49% minimum calcium carbonate, 100% passing #65 sieve.
 - 3. Gypsum: Agricultural grade product containing 80% minimum calcium sulphate.
 - 4. Iron Sulfate: Granulated ferrous sulfate containing 20% to 30% iron and 35% to 40% sulfur. Provide as recommended by soil testing results.
 - 5. Sulphate of Potash: Agricultural grade containing 50% to 53% of water-soluble potash.
 - 6. Single Superphosphate: Commercial product containing 20% to 25% available phosphoric acid.
 - 7. Ammonium Sulphate: Commercial product containing approximately 21% ammonia.
 - 8. Ammonium Nitrate: Commercial product containing approximately 34% ammonia.
 - 9. Calcium Nitrate: Agricultural grade containing 15-1/2% nitrogen.
 - 10. Urea Formaldehyde: Granular commercial product containing 38% nitrogen.
 - 11. I.B.D.U. (Iso Butyldiene Diurea): Commercial product containing 31% nitrogen.
 - 12. Soil Sulfur: Agricultural grade sulfur containing a minimum of 96% sulfur.
 - 13. Iron Sequestrene.
- B. Water: Clean, fresh and potable, as available from Owner. Transport as required.

2.04 HERBICIDES:

- A. For possible use if there is seed germination on-site after sub-grade placement prior to planting mix installation or after subsequent plant mix installation. Under no circumstances are materials to be applied without specific instruction from the Owner's Representative and the Landscape Architect.
- B. Herbicides shall be approved before use for type and rate of application by the Owner's Representative, the Landscape Architect and local and State agencies with jurisdiction.
 - 1. Pre-emergent herbicide shall be an organic liquid herbicide which includes nitrogen fertilizer, "Gluten-8 OLP" as available from Bioscape, Inc (www.bioscape.com, 877.246.7227), or an acceptable equivalent.
 - 2. Post-emergent herbicide shall be an organic contact, non-selective, broad spectrum foliar-applied herbicide that controls actively growing emerged green vegetation, "Nature's Avenger" as available from Bioscape, Inc (www.bioscape.com, 877.246.7227), or an acceptable equivalent.

2.05 ACCESSORIES

- A. Filter Fabric: Provide a heavy duty woven geotextile fabric of polypropylene fibers, Model #140N Drainage Fabric, as manufactured by TenCate Geosynthetics. (www.tencate.com, 888.795.0808) or acceptable equivalent.

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Examine surfaces, substrates and conditions for compliance with requirements of other sections in which that related work is specified, and determine if surfaces, substrates and conditions affecting performance of the work of this Section are satisfactory.
- B. Any soils that have been compacted due to the construction shall be ripped prior to the placement of any soil mixes. The Contractor shall request an inspection by the Landscape Architect prior to the placement of any soil mixes.
- C. Verify the subsurface drainage capability of on-grade plant pits and areas in conformance with Section 32 93 00 Planting
- D. Do not proceed with work of this section until unsatisfactory conditions have been corrected in a manner acceptable to the installer. Starting installation constitutes acceptance of surfaces, substrates and conditions.

3.02 PREPARATION

- A. After fine grading operations have been completed and prior to beginning soil preparation.
 - 1. Take a minimum of three (3) horticultural soil samples where soil conditions or plant types vary, i.e. turf, shrub, slopes, etc.
 - 2. Soil samples are to be collected and tested by a qualified soil testing laboratory (current member of the California Association of Agricultural Labs) and a written report prepared which includes recommendations for soil amendments, fertilization, planting backfill mixes and maintenance.
 - 3. Submit a copy of the report to the Owner's Authorized Representative.
- B. Soil Moisture Content: Do not work soil when moisture content is so great that excessive compaction will occur, nor when it is so dry that dust will form in air or that clods will not break readily.
 - 1. Apply water, if necessary, to bring soil to an optimum moisture content for tilling and planting.
 - 2. Range: Maintain within 2 percent above or below optimum moisture content at all times during the work.
- C. Cultivation of Subgrade: Rip or cultivate subgrade in planting areas to a depth of 24 in. immediately prior to spreading topsoil.
 - 1. Verify that subgrades for installation of topsoil have been established under rough grading. Do not spread topsoil prior to acceptance of subgrade work.
 - 2. Depth: Verify that subgrades are 12 in. minimum below finished grades. Report all variations.
- D. Protect irrigation during placement of soil. Damage to irrigation facilities during placement of soil shall be repaired at the Contractor's expense.

3.03 SOIL AMENDMENT

- A. Amending Existing Soil:
 - 1. Existing soils are defined as in-situ soils. Soils, other than stockpiled topsoil, excavated from other areas of the project are not acceptable for amendment under this section for planting, without prior testing as noted above, including for pH, nutrients and percolation rate.
 - 2. Preparation: Do not commence amending existing soil prior to acceptance of soil cultivation above. Do not work soils under muddy or (frozen) conditions.
 - 3. Soil Amendments per 1,000 Square Feet: Incorporate additives per soils report, if any, thoroughly with top six (6) in. of all existing planting and lawn areas:
 - 4. Incorporate 2" of compost thoroughly with top six (6) in. of all existing planting and backfilled planting areas:
- B. Amending Imported Topsoil:
 - 1. Soil Amendments per 1,000 square feet: Incorporate thoroughly with top six (6) in.:
 - a. 6 cu. yd. Organic compost 55 lbs. Dolomite Lime 10 lbs. Iron SulfateIntent: The above amendments and quantities are approximate and are for bidding purposes only. Following imported topsoil analysis by Testing Agency, composition of amendments may change. Contract Price will be adjusted accordingly.
- C. Spread mycorrhizal inoculant, organic enzymatic fertilizer compound and micro-organism / fertilizer compound evenly over installed and rough graded soil at rates recommended by the Soils Report and/or the manufacturer's written specifications.
- D. Incorporate amendments and fertilizers into top six inches of Amended Planting Soil Mix as recommended by soil testing laboratory.

3.04 PRE-EMERGENT HERBICIDE

- A. Apply chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner's Representative before each application is performed.
- B. Employ a licensed pesticide applicator to apply pre-emergent weed control to all (on-grade) areas to receive woody, non-lawn ornamental planting after incorporating soil amendments.
- C. Apply strictly according to manufacturer's current printed specifications.

3.05 BLENDING OF SOIL MIXES

- A. Stockpiled Topsoil, existing or imported soils:
 - 1. Blending: Thoroughly bulk-blend imported topsoil and amendments recommended by the soil test results uniformly in stockpiles.
 - 2. Testing: Retain a Testing Agency to certify conformance of materials to Specifications and to prepare one laboratory control sample of planting soil mix in accordance with the Specifications.

3.06 SPREADING OF BACKFILL MIXTURE

- A. Coordinate soil mix placement with installation of drainage and irrigation systems. Protect drainage and irrigation during placement of soil. Damage to irrigation or drainage facilities during placement of soil shall be repaired at the Contractor's expense.

- B. Spread backfill mixture or topsoil over accepted subgrade prior to incorporating additional amendments not incorporated at bulk blending, as recommended by soil testing agency..
- C. Do not commence spreading of backfill mixture or topsoil prior to acceptance of soil cultivation above. Do not place amended backfill mixture or topsoil under muddy (or frozen) conditions.
- D. Depth: Minimum depth of 12 in. after natural settlement and light rolling conforming to finished grades shown on Drawings.

3.07 SPREADING OF LAWN MIX SOILS

- A. Place specified soil mix to depths indicated in plan
- B. Place carefully to avoid damage or displacement of other materials such as walls, paving, and drainage components.
- C. Soil shall be placed to within 1 inch greater than final grade or to a depth of no greater than 8 inches and compacted. For final grades less than 8 inches only one round of compaction shall be performed and remaining soil loosely placed such that top of soil exceeds final grade by 1 inch. For final grades greater than 8 inches, place soil at no greater than 6 inches and repeat procedure until soil has been compacted within 1 inch of final grade.
- D. Compaction shall be performed with a 200 – 300 lb. landscape roller or lightly compacted with a hand held mechanical compactor to achieve a 50 – 60 % compaction as determined by ASTM D1557.
- E. After compaction remaining soil shall be placed at 1 inch greater than final grade and thoroughly watered or jetted over entire area. Low settled areas shall be filled with additional soil and re-wet to achieve uniform prescribed final grade.

3.08 FIELD QUALITY CONTROL

- A. Tests: Right is reserved to take samples of soil mixes and/or prepared soil for testing for conformity to Specifications.
- B. Rejected Materials: Remove off site at Contractor's cost. Pay cost of testing of materials, not meeting Specifications.
- C. Contractor shall bear final responsibility for proper surface drainage of planted areas. Any discrepancy in the drawings or specifications, obstructions on the site, or prior work done by another party, which contractor feels precludes establishing proper drainage shall be brought to the attention of the Landscape Architect in writing.

3.09 DISPOSAL AND CLEAN-UP

- A. Maintain the site in an orderly condition during the progress of the Work. Continuously and promptly remove waste materials; keep walks and roads clear.
- B. Promptly remove equipment, surplus materials, refuse and debris resulting from Work upon completion. Leave the site in a neat, orderly "broom clean" condition.
- C. Dispose of all refuse and debris offsite legally. Do not dump or burn materials on site.

END OF SECTION

SECTION 32 91 19**FINISH GRADING****PART 1 - GENERAL****1.01 SUMMARY**

- A. Work Included: Execute finish landscape grades complete, as shown on drawings and as specified.
- B. Related Work:
 - 1. Section 32 91 13 - Soil Preparation
 - 2. Section 32 92 23 - Sod
 - 3. Section 32 92 19 – Seeded Turf
 - 4. Section 32 93 00 - Planting

1.02 SEQUENCING AND SCHEDULING

- A. Complete all finish grading prior to installation of drip irrigation systems in each area graded. Coordinate all work with finished grades of adjacent pavement, curbs, walls and other built improvements.
- B. Re-grade as required to finish grades established by Landscape Architect once the irrigation system is installed.
- C. Dust Nuisance: Assume full responsibility for alleviation or prevention of dust as a result of grading work.

PART 2 - PRODUCTS**2.01 EQUIPMENT**

- A. Contractor shall provide equipment and machinery sufficient for proper execution of Work.
- B. Do not use mechanical compactor to compact soils on structure

PART 3 - EXECUTION**3.01 EXAMINATION**

- A. Verification of Conditions: Verify that the following items have been completed prior to commencement of finish grading:
 - 1. Installation of all drainage.
 - 2. Preparation of subgrade, including the removal of debris.
 - 3. Incorporation of soil amendments.
 - 4. Installation of planting soil mix.

3.02 INSTALLATION

- A. Finish Grading:
 - 1. Provide all grades for natural runoff of water without low spots or pockets. Accurately set flow line grades at 2 percent minimum gradient unless otherwise noted in Drawings.

2. Finish grades shall be smooth, even and on a uniform plane with no abrupt changes of surface. Slope uniformly between given spot elevations.
 3. Grades not otherwise indicated shall be uniform levels or slopes between points where elevations are given, or between points established by walks, paving, curbs or catch basins.
 4. Tops and toes of all slopes shall be rounded to produce a gradual and natural-appearing transition between relatively level areas and slopes.
- B. Tolerances:
1. All planting areas, including lawn areas, shall be true to grade within 1 in. when tested with a 10 ft. straightedge.
 2. Hold finished grades below top of adjacent pavement, headers, curbs, or walls as follows:
 - a. Tree, Shrub, Annual and Groundcover Areas: 2-1/2 inches, or as otherwise indicated on Drawings.

END OF SECTION

SECTION 32 92 19**SEEDED LAWN****PART 1 - GENERAL****1.01 SUMMARY**

- A. Section Includes (but Not Necessarily Limited to):
 - 1. Furnishing and installation of seeded lawn.
 - 2. Lawn renovation.
 - 3. Repair of areas damaged by construction activity.
- B. Related work specified elsewhere:
 - 1. Section 01 56 39 - Temporary Landscape Protection.
 - 2. Section 32 84 00 – Irrigation (Design Build).
 - 3. Section 32 91 13 - Soil Preparation
 - 4. Section 32 93 00 - Planting.

1.02 REFERENCES

- A. Hortus III - 1976 Edition, Bailey Hortorium, Cornell University.
- B. Technical Association of the Pulp and Paper Industry for Wood Cellulose
- C. OMRI, Organic Materials Research Institute
- D. USCC STA, United States Composting Council Seal of Testing Assurance

1.03 QUALITY ASSURANCE:

- A. Landscape work shall be by a state licensed Landscape Contractor with a minimum of ten years of professional experience which has successfully completed landscape work similar in quality and extent to that indicated for this project for a period of not less than five (5) years. Shall be in conformance with Section 32 93 00 Planting.
- B. Supervisory personnel with experience on projects of similar size and extent shall supervise the work.
- C. Plant material must meet or exceed applicable reference standards.
- D. Landscape Architect reserves the right to take and analyze samples of materials for conformity to specifications at any time. Contractor shall furnish samples upon request by the Architect. Rejected materials shall be immediately removed from the site at Contractor's expense. Cost of testing materials not meeting specifications shall be paid by Contractor.

1.04 SUBMITTALS

- A. Within 30 days of Notice to Proceed, document with receipts or invoices that seeding materials have been located and secured for the work by ordering, paying deposits, or as required. Provide name and location of seed source, contact person, and telephone number.
- B. Within 30 days prior to commencement of work submit the test reports, samples, cut sheets and product data listed below.
 - 1. Include all submittals in a single package for a single review.

2. Ensure that each sample, cut sheet, product data and test is clearly marked or labeled to correlate it to its specification, identifying the product, manufacturer and source.
- C. Product Data: Manufacturer's current catalog cuts and specifications for for each type of factory fabricated products and accessories required including, but not limited to:
 1. Seed mix
 2. Organic fertilizer(s)
- D. Submit typed recommended maintenance procedures to be established by Owner.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Labeling: Furnish standard products in manufacturer's standard containers bearing original labels legibly showing quantity, analysis, genus/species and name of manufacturer/grower.
- B. Storage: Protect metal containers from sun during summer months with temperatures above 80 degrees F. Keep plants that cannot be planted immediately upon delivery in the shade, well-protected and well-watered.

1.06 PROJECT/SITE CONDITIONS

- A. Temporary Landscape Protection: see Section 01 56 39.
- B. Climate Restrictions: Do not install lawns during rainy weather.

1.07 SEQUENCING AND SCHEDULING

- A. Acceptance: Do not install plant materials prior to acceptance of finish grades and main line trenching/installation of irrigation system.
- B. Coordinate and cooperate with other Contractors to enable the work to proceed as rapidly and efficiently as possible. The work shall proceed as rapidly as the site becomes available, consistent with normal seasonal limitations for planting work.

1.08 REQUIREMENTS OF REGULATORY AGENCIES

- A. Perform work in accordance with all applicable laws, codes and regulations required by authorities having jurisdiction over such work and provide for all inspections and permits required by Federal, State and local authorities in furnishing, transporting and installing materials.
- B. Certificates of inspection required by law for transportation shall accompany invoice for each shipment of seeds or plants. File copies of certificates with Landscape Architect after acceptance of material. Inspection by Federal or State Governments at place of growth does not preclude rejection of plants at project site.

1.09 MAINTENANCE:

- A. Contractor shall provide maintenance for all plants installed under this Contract for 90 days beginning after the Final Planting Inspection, and as specified herein.
- B. See Section 32 01 90 - Operations and Maintenance of Planting.
- C. Lawn exhibiting conditions which are determined by the Landscape Architect as being unacceptable due to actions during planting and maintenance operations, shall be replaced by Contractor at no additional cost to the Owner.

1.10 WARRANTY PERIOD

- A. Contractor shall warrant that all lawn planted under this Contract will be healthy and in flourishing condition of active growth six (6) months from the end of the Maintenance Period.
- B. Appearance During Warranty: Lawn shall be free of dead or dying patches, and all areas shall show foliage of a normal density, size and color.
- C. Delays: Any delay in completion of planting operations which extends the planting into more than one planting season shall extend the Warranty Period correspondingly.
- D. Replace, without cost to the Owner, all dead lawn and lawn not in a vigorous, thriving condition, as determined by the Landscape Architect during and at the end of Warranty Period. Replacement shall closely match size and habit of adjacent specimens of the same species and shall be subject to all requirements of the Specification.
- E. Contractor shall not be held responsible for failures due to neglect by the Owner, vandalism, abuse or damage by others, or unusual phenomena or incidents which are beyond the Contractor's control, during Warranty Period. Report such conditions to the Landscape Architect in writing.

1.11 CLEAN UP

- A. Keep all areas of work clean, neat and orderly at all times. Keep all paved areas clean during planting operations. Clean up and remove all deleterious materials and debris from the entire work area prior to beginning of landscape maintenance period to the satisfaction of the Landscape Architect.

PART 2 - PRODUCTS**2.01 LAWN SEED**

- A. All seed shall be in conformance with the California State Seed Law of the Department of Agriculture.
- B. Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. In addition, the container shall be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained.
- C. Prior to seeding, the contractor shall provide a letter of certification, original Association of Official Seed Analysts (AOSA) seed test results, and calculations of PLS content.
- D. Lawn seed shall conform to the specification and subject to the Owner's review and approval. To be used in new lawn areas per Drawings and for the repair of dead or damaged lawn.
- E. Seed and blends shall be fresh, clean, new crop seed mix.
 - 1. "Aqua Wise Sportsclub 80/20 Rye/Blue Mix" with the following composition
 - a. 27% Manhattan 5 GLR Perennial Ryegrass
 - b. 27% PR2190 Perennial Ryegrass
 - c. 26% PR2105 Perennial Ryegrass
 - d. 10% Ridgeway Kentucky Bluegrass
 - e. 10% Water Works Kentucky Bluegrass
 - 2. As available from Pacific Coast Seed Inc. (www.pcseed.com, 925.373.4417)
- F. Seed shall test for the following minimum percentages:

1. Purity: 98% minimum.
 2. Germination: 85% minimum.
 3. Weed Seed: 0.25% maximum.
- G. Seed shall be mixed by dealer. Furnish dealer's guaranteed statement of composition, percentage of purity and germination to Landscape Architect.

2.02 ORGANIC FERTILIZER:

- A. Non-synthetic, organic fertilizers as recommended by the soils report and per Section 32 19 30 Soil Preparation. Synthetic, quick-release fertilizers shall not be permitted. Fertilizers prohibited in the Generic Materials List by the Organic Materials Review Institute (OMRI) are prohibited in the project.
- B. Top-dress Fertilizer: Complete fertilizer (NPK, 16-6-8),
1. 50% of the nitrogen to be derived from natural organic sources of urea-form.
 2. Available phosphoric acid shall be from superphosphate, bone or tankage. Potash shall be derived from muriate of potash containing 60% potash.

2.03 WATER.

- A. Potable, clean, and free from harmful materials. Contractor to transport as required.

2.04 WEED CONTROL

- A. Herbicides shall be approved before use for type and rate of application by the Landlord and by local and State agencies with jurisdiction.
- B. Post-emergent herbicide shall be per Section 32 91 13 Soil Preparation

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine surfaces, substrates and conditions (grades, topsoil quality and depth) for compliance with requirements of other sections in which that related work is specified, and determine if surfaces, substrates and conditions affecting performance of the work of this Section are satisfactory.
- B. Conditions permitting the retention of water in planting beds for more than twenty-four (24) hours shall be brought to the attention the Landscape Architect. Submit in writing a proposal for the correction to Landscape Architect for approval before proceeding with work.
- C. Do not proceed with work of this section until unsatisfactory conditions have been corrected in a manner acceptable to the installer. Starting installation of lawns constitutes acceptance of surfaces, substrates and conditions.
- D. Verification of Conditions:
1. Grades: Verify that grades are within 1 inch plus or minus of the required finished grades. Verify that fertilization have been installed in other sections
 2. Verify that all areas to receive lawns are clear of stones larger than 3/4 in. diameter, weeds, debris and other extraneous materials.

3.02 SEED BED PREPARATION (SEEDED LAWN)

- A. Cultivate planting soil areas free of all weed plants and seeds. One month prior to seeded lawn installation, apply water to germinate existing seeds in soil. Apply weed control herbicide in accordance with manufacturer's recommendations.
- B. Roll topsoil with 200 pound water-ballast roller and bring to finish grade.
- C. Lightly rake seed bed surface to 1/4" depth. Seed immediately thereafter, provided the seedbed has remained in friable condition.

3.03 SEEDING OPERATIONS

- A. Seed all lawn grass areas with seed as specified, sowing evenly with an approved mechanical seeder at a rate sufficient to provide even and complete coverage.
 - 1. Culti-packer or approved similar equipment may be used to cover the seed and to form the seedbed in one operation. In areas inaccessible to culti-packer, rake seeded ground with flexible rakes.
 - 2. Take extreme care during seeding and raking to ensure that no change occurs in finish grades and that seed is evenly distributed over entire seedbed.
- B. Seed application rates: as recommended by seed producer.
- C. Roll seeded bed with 200-pound ballast roller.
- D. Apply top-dress organic fertilizer at the rate recommended by the seed supplier and verified by the soil analysis. Anticipate 6 pounds per 1,000 square feet]
- E. Water with fine spray.

3.04 RENOVATION AND REPAIR OF DAMAGED AND BARE/DEAD/DYING LAWN

- A. Clear and grub all dead and damaged lawn and roots.
- B. Rototill 2" of new topsoil into existing soil; in areas too small to utilize a rototiller, utilize handtools to thoroughly mix topsoil with the existing soil.
- C. Lightly compact and grade to conform with the adjacent grades and to ensure positive drainage.
- D. Prepare seed bed and seed as described above.

3.05 PRE-MAINTENANCE INSPECTION

- A. At the completion of all landscape, planting and irrigation work under this contract, and before the beginning of the formal maintenance period, the Pre-Maintenance Inspection shall be performed.
- B. The Contractor shall request the inspection in writing to the Landscape Architect ten days before the completion of work in order that a mutually agreeable time for inspection may be arranged.
- C. The Landscape Architect, Contractor and such others as the Owner shall direct, shall be present at the inspection.
- D. At the time of Pre-Maintenance Inspection, the Contractor shall have all planting areas, under this contract, free of weeds and neatly cultivated.

- E. If, after the inspection, the Landscape Architect is of the opinion that all work has been performed as per the drawings and specifications and that all plant materials are in satisfactory growing condition, he will give the Contractor written notice of acceptance and commencement of the formal maintenance period.
- F. Work requiring corrective action in the judgment of the Landscape Architect shall be performed within ten days after the pre-maintenance inspection. Corrective work and materials replacement shall be in accordance with the drawings and specifications and shall be made by the Contractor at no cost to the Owner.
- G. No partial approvals will be given.

3.06 MAINTENANCE OF PLANTING

- A. From the time seeded lawn is installed until Final Acceptance Inspection, the Contractor shall ensure that lawn is watered, fertilized and mown; trash and debris removed; weeds controlled; and erosion repair and reseeding completed as necessary to establish a uniform stand of the specified grasses.
- B. The Contractor shall provide lawn planting with a minimum coverage of 95% of the specified planting, with no bare spots greater than one square foot (1 SF). Prior to the Final Acceptance inspection, the lawn must be in a healthy, vigorous condition, and have had two mowings.
- C. Contractor shall replant or reseed specified lawn on bare areas not meeting specified coverage as determined by the Landscape Architect. Such replanting to be performed within 30 days of notification by the Landscape Architect.
- D. Maintenance Period shall be per section 32 01 90 Operation and Maintenance of Planting and shall occur concurrently with all other planting.

3.07 FINAL ACCEPTANCE INSPECTION:

- A. Shall be as per Section 32 93 00 Planting.

3.08 CLEANUP AND PROTECTION

- A. During planting operations, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect planting from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. Promptly remove soil and debris created by planting work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- D. Erect temporary fencing or barricades and warning signs, as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after planting is established.
- E. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- F. Erosion: Immediately restore eroded areas. Keep all adjacent paved surfaces cleaned of dirt, mud or stains and organic debris.

END OF SECTION

SECTION 32 93 00**PLANTING****PART 1 - GENERAL****1.01 SUMMARY**

- A. Work Included: Provide planting complete, as shown and as specified. Plantings shall meet the Bay-Friendly Landscape Guidelines.
 - 1. Furnishing and planting of trees, shrubs, vines, groundcovers, and perennials.
 - 2. Staking.
 - 3. Mulching, fertilizer.
 - 4. Clean-up.
 - 5. Inspections.
 - 6. Maintenance Period
 - 7. Warranty Period.
 - 8. Final Acceptance Inspection.
- B. Related Work:
 - 1. Section 12 93 00 - Site Furnishings and Features
 - 2. Section 32 01 90 - Operation and Maintenance of Planting
 - 3. Section 32 84 00 – Irrigation (Design-Build)
 - 4. Section 32 91 13 - Soil Preparation
 - 5. Section 32 91 19 – Finish Grading
 - 6. Section 32 92 19 – Seeded Turf

1.02 REFERENCES

- A. "An Annotated Checklist of Woody Ornamental Plants of California, Oregon and Washington, (Number 4091)", McClintock and Leiser, Division of Agricultural Sciences, University of California, 1979.
- B. "American Standard for Nursery Stock", 1986 Edition, American Association of Nurserymen, Inc.
- C. Western Chapter of International Society of Arboriculture Pruning Standards
- D. ANSI A300 Pruning Standards
- E. OMRI, Organic Materials Research Institute
- F. USCC STA, United States Composting Council Seal of Testing Assurance
- G. "American Standard for Nursery Stock", current Edition, American Association of Nurserymen, Inc.
- H. "Hortus III", 1976 Edition, Bailey Hortorium, Cornell University.
- I. Bay Friendly Landscape Guidelines, Stopwaste.org

1.03 DEFINITIONS

- A. The "Owner's Representative" is the person, appointed by the Owner, to represent their interests. The Owner's Representative will be on site frequently and regularly during construction. Where needed, the Owner's Representative will identify the need for field visits by the Owner's Representative or other consultants.
- B. "Integrated Pest Management" (IPM) is a holistic approach to mitigating insects, plant diseases, weeds, and other pests. It involves the use of many strategies for managing, but not eliminating pests. IPM uses cultural, mechanical, physical, and biological control methods before using pesticides to control pests and diseases in the landscape. Chemical controls are applied only when monitoring indicates that preventative and non-chemical methods are not keeping pests below acceptable levels. When pesticides are required, the least toxic and the least persistent pesticide that will provide adequate pest control is applied.
- C. The "Organic Materials Research Institute" (OMRI) is a national nonprofit organization founded in 1997 to support the organic community. OMRI reviews products to determine their suitability for producing, processing and handling organic food and fiber under the USDA National Organic Program Rule (OMRI General Materials List).

1.04 QUALITY ASSURANCE:

- A. Products Criteria:
 - 1. When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.
 - 2. Plant material must meet or exceed applicable reference standards.
- B. Landscape work shall be by a state licensed Landscape Contractor with a minimum of ten years of professional experience which has successfully completed work similar in quality and extent to that indicated for this project.
 - 1. Installer shall be a member in good standing of the American Nursery and Landscape Association with no less than 4 years experience in landscape installation work similar in quality and extent to that indicated for this project.
 - 2. Installer shall maintain an experienced full-time supervisor on Project site when work is in progress.
 - 3. Herbicide Applicator: Licensed in California for commercial applications.
- C. An independent laboratory shall have the experience and capability to conduct the testing indicated and specializes in types of tests to be performed.
- D. Source Quality Control
 - 1. Review: Submit a written request for review of plants and quantity at place of growth at least thirty (30) calendar days prior to shipment to site. Right is reserved to refuse review at this time if, in his/her judgment, a sufficient quantity of plants is not available. Landscape Architect also reserves the right to review representative photographs in lieu of nursery visit(s).
 - 2. Contractor shall accompany Landscape Architect to all reviews of plants at the nursery. Landscape Architect will review and tag plants at place of growth and / or via representative photographs, and upon delivery for conformity to specifications.

3. Submit photographs for review with a person or measuring device adjacent to each tree and plant type for scale. Photographs should provide sufficient indication of form, type and size and may require more than one photograph of each tree or plant type. Trees should be clearly photographed to indicate branching as well as root crown condition.
 4. Plant reviews by representative photographs or at the nursery shall not impair the right of review and rejection upon delivery to the project or during the progress of the work.
 5. Unavailable Material: If proof is submitted that a specified plant is not obtainable, a proposal will be considered for use of the nearest equivalent size or variety with corresponding adjustment of Contract price. Substantiate such proof in writing no later than 30 days after award of contract.
 6. Special Conditions: The above provisions shall not relieve Contractor of the responsibility of obtaining specified materials in advance if special growing conditions or other arrangements must be made in order to supply specified materials.
- E. Conduct a pre-installation conference at Project site.
1. Person(s) responsible for the Work of this Section shall attend a Pre-construction Conference with the Architect, Landscape Architect, General Contractor, the Installer and the Installer's field foreman.
 2. To review the proposed schedule, the coordination with work of other trades, the source of plants, the consideration of substitutions, and a general review of the specifications and planting procedures.
 3. Contractor shall coordinate the meeting and inform all parties in writing five (5) business days in advance of the scheduled meeting.

1.05 SUBMITTALS

- A. Within 30 days of Notice to Proceed, document with receipts or invoices that all plants have been located and secured for the work by ordering, paying deposits, or as required. Provide name and location of nursery, contact person, and telephone number.
- B. Within 30 days prior to commencement of work submit the test reports, samples, cut sheets and product data listed below.
1. Include all submittals in a single package for a single review.
 2. Ensure that each sample, cut sheet, product data and test is clearly marked or labeled to correlate it to its specification, identifying the product, manufacturer and source.
 3. Other tests as noted herein in this specification section, including but not limited to drainage test of on-grade plant pits and planting areas.
- C. Product Data: Submit manufacturer's literature for each type of factory fabricated products and accessories required including, but not limited to:
1. Tree staking materials.
 2. Mulches.
 3. Fertilizers
 4. Herbicides
- D. Samples:
1. Tree ties: Two (2) twelve inch lengths.
 2. Mulch: Two one (1) pint containers, each type.
 3. Organic Compost: Two one (1) pint containers, each type.
 4. Geotextile (Filter) Fabric: Two 12" square pieces.
 5. Fertilizers: Two one-half (1/2) pint containers, each type.

- E. Notice of Shipment: At time of delivery, submit notice from nursery containing the following: Name and location of shipper; date of shipment; name of commodity; quantity; certificate that material complies with the specifications; size; statement of root pruning, including dates; and statement that plants are acclimated and have been growing outside.
- F. Submit certificates of conformance for mulches. Furnish a certificate with each delivery to the site of material in containers, or in bulk. Certificate to state source, quantity or weight, type and analysis, and date of delivery. Deliver all certificates to Owner's Representative.
- G. Certificates of Inspection: As required by law for transportation of each shipment of plants along with invoice.
- H. Submit typed recommended procedures to be established by Owner for maintenance

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Do not deliver to the site disease-infected plant materials.
- B. Labeling: Furnish standard products in manufacturer's standard containers bearing original labels legibly showing quantity, analysis, genus/species and name of manufacturer/grower.
- C. Storage: Protect metal containers from sun during summer months with temperatures above 80 degrees F. Keep plants that cannot be planted immediately upon delivery in the shade, well-protected and well-watered.
- D. Handling: Do not lift or handle plants by tops, stems or trunks at any time. Do not bind or handle plants with wire or rope at any time except wrapped rootball of field dug material.
- E. Anti-Desiccant: do not use spray anti-desiccants
- F. Digging: Dig B & B plants with firm, natural balls of earth of diameter not less than that recommended by USDA Standard for Nursery Stock, and of sufficient depth to include the fibrous and feeding roots. Wrap and tie as required to prevent all cracking or loss of soil from rootball.

1.07 PROJECT / SITE CONDITIONS

- A. Replacement of Damaged Plants:
 - 1. Replace existing plants to remain which are damaged by Contractor during construction with accepted plants of the same species and size as those damaged at no additional cost to Owner.
 - 2. Landscape Architect will determine extent of damage and value of damaged plants.

1.08 SEQUENCING AND SCHEDULING

- A. Acceptance: Do not install plant materials prior to acceptance of finish grades and main line trenching/installation of irrigation system.
- B. Coordination: Coordinate with work of other sections to insure the following sequence of events:
 - 1. General: Irrigation system to be installed and operable prior to installation of plant materials. Schedule hand watering of all plant materials installed prior to sprinkler irrigation system.
 - 2. Pruning: Do not prune plant materials prior to installation and acceptance. Request review by Landscape Architect prior to pruning.

1.09 REQUIREMENTS OF REGULATORY AGENCIES

- A. Perform work in accordance with all applicable laws, codes and regulations required by authorities having jurisdiction over such work and provide for all inspections and permits required by Federal, State and local authorities in furnishing, transporting and installing materials.
- B. Certificates of inspection required by law for transportation shall accompany invoice for each shipment of seeds or plants. File copies of certificates with Landscape Architect after acceptance of material. Inspection by Federal or State Governments at place of growth does not preclude rejection of plants at project site.

1.10 WARRANTY

- A. Warrant that all plants planted under this Contract will be healthy and in flourishing condition of active growth one (1) year from date of Final Acceptance.
- B. Correct Species: Warrant that all plant materials are true to species and variety.
- C. Delays: Delays caused by the Contractor in completing planting operations which extend the planting into more than one planting season shall extend the Warranty Period correspondingly.
- D. Condition of Plants: Plants shall be free of dead or dying branches and branch tips, with foliage of normal density, size and color.
- E. Replacements: As soon as weather conditions permit, replace, without cost to Owner all dead plants and all plants not in a vigorous, thriving condition, as determined by Landscape Architect during and at the end of Warranty Period.
- F. Exclusions: Contractor shall not be held responsible for failures due to neglect by Owner, vandalism, and acts of God, during Warranty Period. Report such conditions.

1.11 MAINTENANCE PERIOD AND FINAL ACCEPTANCE:

- A. See Section 32 01 90 Operation and Maintenance of Planting

1.12 REPLACEMENTS

- A. Failed Materials:
 - 1. Repair and/or replace at no cost to the Owner all plant materials exhibiting conditions which are determined as unacceptable due to workmanship by the Contractor.
 - 2. Closely match replacements to adjacent specimens of the same species. Apply requirements of this Specification to replacements.
 - 3. Contractor shall be held responsible for a maximum of two (2) replacements for each failed tree, shrub and vine, and same area of groundcover planting after final acceptance during warranty period.
- B. Incorrect Materials:
 - 1. During Warranty Period, replace at no cost to Owner plants revealed as being untrue to name and species.
 - 2. Provide replacements of a size and quality to match the planted materials at the time the mistake is discovered.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. Plant Materials: Verify that all container stock (excluding annuals) has been grown in the containers in which delivered for at least one growing season, but not over two (2) years.
1. Growing Conditions: Plants shall be nursery-grown in accordance with good horticultural practices under climatic conditions similar to those of project for at least two years unless otherwise specifically authorized.
 2. Appearance: Trees shall be exceptionally heavy, symmetrical, tightly knit, and so trained or favored in development and appearance as to be superior in form for their species, with regard to number of branches, compactness and symmetry.
 3. Vigor: Plants shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs, or larvae. They shall have healthy, well-developed root systems. Plants shall be free from physical damage or adverse conditions which would prevent thriving growth.
- B. Condition of Root System: Samples must prove to be completely free of circling, kinked or girdling trunk surface and center roots and show no evidence of a pot-bound condition. Upon inspection by Landscape Architect at the job site, if five (5) percent or more of the plants of each species are found to contain kinked, circling or girdling roots, all plants of that species will be rejected.
- C. Measurements:
1. General: Take caliper measurement at a point on the trunk 6 in. above natural ground line for trees up to 4 in. in caliper and at a point 12 in. above the natural ground line for trees over 4 in. in caliper.
 - a. Trunk diameter six inches above rootball within the diameter range shown below:

Container size	caliper
5 gallon	0.5" - 1"
15 gallon	1" - 2"
24" box	2" - 3"
36" box	3" - 5"
 - b. Measure foliage across mean foliage dimension when branches are in their normal upright position. Foliage origin along main trunk shall be measured from soil line. Height and spread dimensions specified refer to main body of plant and not branch tip to tip. Properly trimmed plants shall measure the same in any direction. If a plant is unevenly grown, it shall be classified in the size category of the smallest dimension. Size Range: If a range of size is given, do not use plant materials less than the minimum size. The measurements specified are the minimum size acceptable and are the measurements after pruning, where pruning is required. Plants that meet the measurements specified, but do not possess a normal balance between height and spread shall be rejected.
- D. Substitutions.

1. Substitutions must have written approval of Owner's Representative and equal the standard of products specified in the Construction Documents.
 2. Substituted plants shall be true to species and variety and shall conform to measurements specified except that plants larger than specified may be used if accepted. Use of such plants shall not increase Contract price. If larger plants are accepted, increase the ball of earth in proportion to the size of the plant. Plants overgrown for their container size will be rejected.
 3. Installation of approved substitution is Contractor's responsibility. Changes required for installation of approved substitution must be made to the satisfaction of Owner's Representative and without additional cost to the Owner.
 4. Approval by Owner's Representative of substituted equipment does not waive these requirements.
- E. Unacceptable Trees: Trees which have damaged or crooked leaders, will be rejected. Trees having a main leader shall not have been headed back. Trees with abrasions of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over 3/4 in. which have not completely callused, will be rejected. Temporary branches shall be present along the lower trunk and shall be no greater than 3/8" diameter.
- F. Pruning: Do not prune plants before delivery. Consult Landscape Architect for pruning after installation.
- G. Soil Mixes: See Soil Preparation - Section 32 91 13.

2.02 ACCESSORIES

- A. Tree Staking
1. Stakes: Lodgepole Pine, untreated, with 10 in. tapered driving point and chamfered top, 2 per non street tree, or as otherwise indicated or required by local ordinances.
 2. Spreader Board: 1" x 4" treated wood, length determined by stake spacing.
 3. Auxiliary Stakes: 1/4 in. - 1/2 in. diameter spring-steel wire, fiberglass rod, bamboo, or split wood, as accepted by Landscape Architect. Stakes shall have no rough or sharp edges capable of damaging bark.
 4. Ties: Ties made of webbed material, 3/4" wide flat woven polypropylene w/900-lb breaking strength; specifically designed for securing trees to staking materials, "Arbortie" by Deep Root Partners, LP (www.deeproot.com, 800.458.7668); color: olive green or acceptable equivalent.
- B. Mulch
1. Composted pine or fir (hardwood) bark, free of dirt, dust and other debris. Provide 1/4"-3/8" "Mini-Mulch Fir Bark" as available from Lyngso Garden Materials (www.lyngsogarden.com, 650.364.1730) or acceptable equivalent.
 1. Slow-release organic fertilizer shall be a high-protein, slow-release pelleted animal and/or plant derived-protein (non-manure) with a nitrogen level over 6%, either:
 - a. "Phyta-Grow Pre-Plant Plus (7-5-7)," a blend of molasses, feathermeal, bone meal and mined potassium sulfate which supply controlled-release nitrogen, phosphorus and potassium; by California Organic Fertilizers Inc. (www.organicag.com, 800.269.5690) and as available from Harmony Farm Supply and Nursery (www.harmonyfarm.com, 707.823.9125) or acceptable equivalent.
 - b. "Phyta-Boost Plant Food 7-1-2" by California Organic Fertilizers Inc. (www.organicag.com, 800.269.5690) and as available from Peaceful Valley Farms

(www.groworganic.com, 888.784.1722) or SiteOne Landscape Supply
(www.siteone.com, or acceptable equivalent).

2. Non-synthetic, organic fertilizers as recommended by the soils report and per Section 32 19 30 Soil Preparation. Synthetic, quick-release fertilizers shall not be permitted. Fertilizers prohibited in the Generic Materials List by the Organic Materials Review Institute (OMRI) are prohibited in the project.
- D. Herbicides
1. For possible use if there is seed germination on-site after planting mix placement prior to plant installation. Under no circumstances are materials to be applied without specific instruction from the Owner's Representative and the Landscape Architect.
 2. Herbicides shall be approved before use for type and rate of application by the Owner's Representative, the Landscape Architect and local and State agencies with jurisdiction.
 3. Post-emergent herbicide shall be per Section 32 91 13 Soil Preparation
- E. Water:
1. Clean, fresh and potable, furnished and paid for by Owner.
 2. Transport as required.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
1. Finish Grades: Finish grades for planting areas shall have been established in another Section. Verify that all grades are within 1 in. plus or minus of required finish grade.
 2. Soil Preparation: Do not commence planting work prior to completion and acceptance of soil preparation, including subsurface drainage of on-grade plant pits and planting areas .
 3. Irrigation: Verify that irrigation system has been installed and accepted.

3.02 PREPARATION

- A. Layout and Staking: Lay out plants at locations shown on Drawings. Use 3 -ft. lath, color-coded for each species of plant material. Stake each tree, not specifically located by dimension or alignment. Outline shrub and groundcover beds with lime.
- B. Review: Locations of plants will be checked in the field and will be adjusted to exact position before planting begins. Right is reserved to refuse review at this time if, in the Landscape Architect's opinion, an insufficient quantity of plants is available.
- C. Digging Tree Pits: Dig tree pits and scarify all sides of the tree pit after excavation - see below. Do not use an auger or tree spade.
- D. Containerized Plant Pits: Excavate square plant pits as follows:

Width	Depth
Boxed Trees	Box + 24 in.
Canned Trees	Can + 18 in.
Canned Shrubs and Vines	Can + 12 in.

3.03 DRAINAGE TEST OF ON-GRADE PLANT PITS/OBSTRUCTIONS

- A. Testing: Immediately after completion of excavation, test drainage of plant pits by filling with water twice in succession. Give written notification of conditions permitting the retention of water in plant pits for more than twenty-four (24) hours.
- B. Correction: Submit for acceptance a written proposal and cost estimate for the correction of poor drainage conditions before proceeding with planting.
- C. Obstructions: If rock, underground construction work, tree roots or other obstructions are encountered in the excavation of plant pits, acceptable alternate locations may be used at direction of Landscape Architect.
- D. Percolation Test Pit:
 1. Location: At tree planting at four (4) locations as determined by the Landscape Architect on site.
 2. Restrictions: Do not perform test on a rainy day. Repeat all tests interrupted by rain or cold.
 3. Procedure:
 - a. Dig test pit of a size specified for the tree pits, a minimum of 4 ft. deep. Legibly calibrate a stake at 1 in. intervals and drive it firmly into the undisturbed soil at the bottom of the pit. Fill test pit with water to within 1 ft. of the finish grade. Immediately record water level on the stake. After 3 hours, record water level again. Repeat recording of water level once each hour for the succeeding five hours. Documentation: Submit written documentation of all test pit results, dated and signed by the tester.

3.04 TREE AND SHRUB PLANTING

- A. Handling and De-potting of Plant Materials:
 1. Damage: Avoid damage to containers and rootballs. If rootball is cracked or broken during handling and de-potting, plant will be rejected. Do not remove plant from container prior to completion of plant pit preparation.
 2. Canned Trees and Shrubs: Metal Containers: Cut can on two sides with accepted cutting tool. Do not use spade. Plastic Containers: Tip container to horizontal orientation and shake carefully to remove shrub. Support rootball during installation to prevent cracking or shedding of soil.
 3. Boxed Trees: Lift from bottom with forklift or from sides with 2 in. x 4 in. rails nailed to each side of box. Do not remove box prior to settling tree in plant pit. Remove sides of box after acceptance by Landscape Architect and prior to backfilling. Bottom of box may be left in place.
 4. Root prune. Prune rootball of tree designated for 4th floor planter under guidance and direction of certified Arborist. Use clean sharp tools to remove stem girdling roots and kinked roots. Prune as recommended by Arborist to promote fibrous root growth.

- B. Installation:
1. Scarification:
 - a. Plant Rootball: After removing plant from container, scarify the sides of the rootball to a depth of 1 in. at four to six equally-spaced locations around the perimeter of the ball or at 12 in. intervals on sides of boxed materials. Cut and remove circling roots over 3/8 in. diameter. Plant Pit: Scarify sides of plant pit, thoroughly breaking up surfaces and eliminating "glazed" areas. Positioning: Backfill plant pit to allow setting crown of tree 2 in. above new finish grade and crown of shrub 1 in. above finish grade. Thoroughly foot tamp all backfill. Position plant in planting pit, maintaining plumb condition. Maintain throughout all planting operations.
 3. Backfilling:
 - a. Use specified soil mix to backfill (on-grade) plant pits as shown on Drawings. Brace each plant plumb and rigidly in position until planting soil has been tamped solidly around the ball and roots. When plant pits have been backfilled approximately 2/3 full, water thoroughly and saturate rootball, before installing remainder of the backfill mix to top of pit, eliminating all air pockets. Stake as specified below.
 5. Slow-release Fertilizer
 - a. Pelletized fertilizer. Distribute evenly in plant pits when backfilled 2/3 and in the area surrounding the hole (Phyta Boost 7-1-2 at 10 to 20 lbs / 1000 SF; or Phyta-Grow 5-7-5 at 30 to 50 lbs / 1000 SF) per manufacturer's specifications.
- C. Watering Basin: Form saucer with 3 in. high berm centered around tree and shrub pits 12 in. wider than ball diameter. Do not form saucer around trees in lawn areas.
- D. Watering: Immediately water all plants after completion of planting operations.

3.05 STAKING

- A. General:
1. Trees shall be able to stand upright without support, and shall return to the vertical after their tops have been deflected horizontally and released. Stake or guy trees which do not meet this qualification.
 2. Trees shall remain plumb and straight from installation through the warranty period.
- B. Stake all trees under 3-1/4 in. caliper in accordance with the following table at on-grade tree plantings only:

Tree Caliper @ 12 in. Above-Grade	# Stakes	Stake Size
To 1-3/4 in.	3	3 in. Diam. x 8 ft. min.
2 in. to 3 in.	3	3 in. Diam. x 10 ft. min.

1. Locate stakes as detailed in the Drawings, perpendicular to prevailing wind and as close to the main trunk as is practical, avoiding root injury. Drive stakes at least 36 in. into firm ground.
2. Nail 1 in. x 4 in. spreader board to stakes at detailed height making sure minimum trunk clearance is maintained.

3. Remove nursery-supplied stake and tie to new stakes using two tree ties. Find proper height for point of tree ties and attach as follows:
 - a. Hold trunk in one hand, pull top to one side and release. Height at which trunk will snap back to upright position while hand-held is Base Height. Attach tree ties to trunk 6 in. above Base Height.
 - b. Tie tree to stakes using approved tree tie as indicated on the Drawings and per manufacturer's written recommendations. After securement, cut off stakes to an even height determined by the Landscape Architect.
 - c. If trunk is too "whippy" to support tree plumb, use auxiliary stake as follows:
 - 1) Attach auxiliary stake as required to support trunk. Extend stake 3 in. below finish grade up to a point no closer than 24 in. from top of leader.
 - 2) Round and wrap the ends of the stake with friction tape. Attach stake to trunk with 1 in. wide vinyl or polyethylene tape at 10 in. to 15 in. intervals.

3.06 PRUNING:

- A. See Section 32 01 90 – Operation and Maintenance of Planting.

3.07 MULCHING

- A. Install a 3 inch deep (as indicated on Drawings) layer of mulch over all tree and shrub areas including tree and shrub watering basins. Do not mulch over the root crown.

3.08 PESTICIDE / HERBICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner's Representative before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Non-Selective): Applied to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations.
- C. Post-Emergent Herbicides (Selective and Non-Selective): Applied only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.09 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- D. Erect temporary fencing or barricades and warning signs, as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- E. After installation and before Substantial Completion remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

- F. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- G. Provide maintenance immediately after planting and per Section 32 01 90 Operation and Maintenance of Planting.

END OF SECTION