Standard Drawings and Specifications

Department of Public Works
2018

Department of Public Works
City of Palo Alto
250 Hamilton Avenue
Palo Alto, California, 94301
http://www.cityofpaloalto.org/PWDStandards
Tel (650) 329-2295

Published
First Edition April 1964
Second Edition December 1972
Third Edition December 1992
Fourth Edition May 2007
Fifth Edition January 2018

In compliance with the Americans with Disabilities Act of 1990 (ADA), this document may be provided in other accessible formats upon request.

For information contact:

Office of the ADA Coordinator
City of Palo Alto
285 Hamilton Avenue – 1st Floor
Palo Alto, CA 94301
Chief Building Official - (650) 329-2550 (voice)

CERTIFICATION

STANDARD PLANS & SPECIFICATIONS
DEPARTMENT OF PUBLIC WORKS
2018 EDITION

These Standard Specifications were established by the Director of Public Works and first published in April of 1964. These Standard Specifications were last updated in January, 2018 and made effective on the 1st day of February, 2018. Any plans and specifications submitted thereafter for approval by City shall abide by these Specifications.

DocuSigned by:
J M Sartor
8007E5BC39BA4A1...

1/11/2018

James Michael Sartor, P.E. — Date
Director of Public Works / City Engineer

DocuSigned by:
Brad Eggleston
DF8505A6373A4DF...

1/11/2018

Brad Eggleston, P.E. — Date
Assistant Director of Public Works, Engineering Services Division

TABLE OF CONTENTS

PART I – TECHNICAL SPECIFICATIONS

PART II - STANDARD DRAWINGS

Dwg
No. DESCRIPTION

Curb Ramps, Curb and Gutters, Valley Gutters, Sidewalks and Driveways

Street Cross-Sections

Drainage

Trenches

Irrigation

Miscellaneous

TECHNICAL SPECIFICATIONS

PART I

SECTION 1

DEFINITIONS

The following terms and abbreviations, whether stated in the singular or plural word form, used in these Specifications shall have the meanings set forth below, unless the context clearly indicates otherwise:

1.01 "A.A.S.H.T.O." means the American Association of State Highway and Transportation Officials.

1.02 "Architect" means the person who is designated in the Contract as the Architect for the Project.

1.03 "A.S.T.M." means the American Society for Testing and Materials.

1.04 "Business Day" means any calendar day except a Saturday, Sunday, and any day observed as a legal holiday by the City.

1.05 "Caltrans Standard Specifications" means the standard specifications of the State of California, Department of Transportation, in effect on the Date of Execution. References to the section numbers of the Caltrans Standard Specifications are made to the section numbers in effect on the Date of Execution, as may be amended from time to time. If, in subsequent editions, the section numbers are changed, the reference shall be construed to refer to the class of material or item in the latest edition which was designated by that number in that current edition.

1.06 "City" means the City of Palo Alto, a municipal corporation, as defined in Section 1.04.050(1) of the Palo Alto Municipal Code, as amended.

1.07 "City Inspector" means any person who is authorized to inspect the project or any aspect thereof for and on behalf of the City, including, without limitation, the Engineer and the Project Manager.

1.08 “Contract” means a legally binding written agreement between two or more parties, such as one between the City and the Contractor.

1.09 "Contractor" means (a) the lowest responsible bidder who has entered into the Contract with the City and includes the Contractor's directors, officers, employees, partners, principals, agents, subcontractors and representatives, (b) companies working for a party other than the City under a City-issued street work permit, or (c) companies otherwise working within the City right-of-way.

1.10 “Date of Execution” means either (a) the date on which all parties have signed the Contract, (b) the date that the permit authorizing street work is issued.

1.11 "Day" means any calendar day, unless a business day is specified.

1.12 "Drawings" means the official project drawings of the City.

1.13 "Engineer" means the Engineer of the City, or a designated representative (including, without limitation, the acting Engineer).

1.14 "Other Specifications" means the specifications set forth in the materials of the A.A.S.H.T.O., the A.S.T.M., the Caltrans Standard Specifications, and others referenced in the Project Specifications.

1.15 "Project Manager" means the City employee, or a designated representative, who is authorized by the City Manager to manage the project for and on behalf of the City.

1.16 "Standard Drawings" means the drawings or reproductions thereof, approved by the Engineer, which show the location, character, dimensions and details of the work to be performed and which are included or referred to in these Standard Drawings and Specifications.

1.17 "Standard Drawings and Specifications" means the City's Department of Public Works' standard Public Works provisions, consisting of the following categories: the Technical Specifications and the Standard Drawings.

1.18 “Subgrade” means the portion of the roadbed or sidewalk on which pavement, surfacing, base, subbase, or a layer of any other materials is placed.

1.19 "Technical Specifications" means the terms described in the Standard Drawings and Specifications.

1.20 "Underground Facilities" means any and all cables, conduits, ducts, manholes, pipes, tanks, tunnels, vaults, wires and other utilities, infrastructure attachments or facilities which have been installed underground to furnish any of the following: cable television, electricity, liquid petroleum products (including natural gas), sewage and stormwater removal, steam, telephone or other communications systems, traffic or other control systems or water.

1.21 “Work” means the scope of work included within the project.

1.22 "Working Day" means any day during the contract time on which the Contractor is required to perform work and is not excused from performing the Work under the contract.

END OF SECTION

SECTION 2

REFERENCE TO CALTRANS STANDARD SPECIFICATIONS

2-1 General - When reference is made to the Caltrans Standard Specifications, the Work embraced herein shall be done in accordance with the appropriate provisions of the current edition of the Caltrans Standard Specifications entitled "State of California, Department of Transportation Standard Specifications."

A. Whenever in the Caltrans Standard Specifications the following terms are used, they shall be understood to mean and refer to the following:

Department of Public Works	The Department of Public Works, City of Palo Alto
Director of Public Works	The City Engineer
Engineer	The Engineer of the City acting directly on behalf of and under the authority of the Director of Public Works within scope of the duties entrusted to him or her.
Laboratory	The designated laboratory authorized by the City to test materials and work involved in the contract.
City	The City of Palo Alto

B. In case of conflict between the Caltrans Standard Specifications and the Standard Drawings and Specifications, the Standard Drawings and Specifications shall take precedence.

C. When no reference to a portion of construction is made in the Drawings, the Standard Drawings and Specifications, the job specifications, or through the Engineer, the Contractor shall refer to the appropriate section in the Caltrans Standard Specifications, and such reference shall be confirmed in writing by the Project Manager.

END OF SECTION

SECTION 3

TEMPORARY CONTROLS

3-1 **Traffic Control** - Traffic control plans shall be submitted by the Contractor and shall conform to the conditions as set forth in the City's Traffic Control Requirements as compiled and distributed by the Transportation Division. The Transportation Division shall review and approve traffic control plan prior to Contractor starting the work.

A. Digest of truck regulations (Refer to Map herein)

1. Truck: Any vehicle exceeding a maximum gross weight of seven (7) tons.

2. Restricted Street: All streets in the City except through and local truck routes.

3. Through Truck Route: Any street upon which the unrestricted use of trucks is permitted. Through truck routes are indicated as heavy lines on the map.

4. Local Truck Route: Any street upon which trucks with an origin and/or destination in the City may operate but only between the hours of 7:00 AM and 7:00 PM. These local truck routes become restricted streets between the hours of 7:00 PM and 7:00 AM. Local truck routes are indicated as dashed lines on the map.

B. General

1. No truck shall be driven in any business district between the hours of 7:00 AM to 6:00 PM on any day except Sunday if its load extends more than three (3) feet to the front or more than ten (10) feet to the rear.

2. When appropriate signs are erected, no person shall operate, drive, or cause to permit to be operated or driven, any truck on any restricted street except as hereinafter provided.

3. No truck shall enter or leave the City except on a through or local truck route.

4. All trucks entering the City for destinations outside the City shall operate only over a through truck route.

5. All trucks entering the City for destinations in the City shall proceed only over a through or local truck route and shall deviate there from only by the shortest and most direct route between each destination and the nearest through or local truck route. Upon leaving each destination, a deviating truck shall return to the nearest through or local truck route by the shortest and most direct route except

that it may go directly to the next destination by the shortest and most direct route without regard to truck routes if it will result in a shorter distance being traveled on restricted streets.

6. All trucks, on a trip originating in the City and traveling in the City for destinations outside the City, shall proceed by the shortest and most direct route to the nearest through or local truck route.

7. All trucks, on a trip originating in the City and traveling for destinations in the City, shall proceed by the shortest and most direct route to the nearest through or local truck route and shall then deviate there from only by the shortest and most direct route between each destination and the nearest through or local truck route except that it may go directly to the next destination by the shortest and most direct route without regard to truck routes if it will result in a shorter distance being traveled on restricted streets.

8. All trucks making deliveries or pickups east of Middlefield Road (assuming Middlefield to run north-south) must come from through or local truck routes east of Middlefield.

9. All trucks making deliveries or pickups west of Middlefield Road must come from through or local truck routes west of Middlefield.

10. All trucks making deliveries or pickups to the Middlefield Road multiple delivery zones must use Oregon Expressway twenty-four (24) hours a day. All trucks making deliveries or pickups to other sections of Middlefield Road may use any through or local truck route, but must remain on the through or local truck route to the point nearest their destinations.

11. All trucks making deliveries or pickups to Stanford Industrial Park must come from El Camino Real, Alma Street, or Page Mill Road or from Bayshore via San Antonio Road between Bayshore and Alma without using any restricted streets between Bayshore and El Camino Real.

C. Weigh – In: Any police officer shall have the authority to order any commercial vehicle not on a through truck route to a public or private scale to determine if it is in compliance with this section of the Code.

D. Exceptions

1. Trucks making pickups or deliveries on restricted streets can use restricted streets between the nearest through or local truck route and the specific address.

2. This section shall not apply to the following:

   a) Passenger buses controlled by the Public Utilities Commission (PUC) and school buses.

   b) Any vehicle owned or operated by a public utility, or by the City, or refuse vehicles under contract with the City.

   c) Any authorized emergency vehicle.

E. Grading Permits: Truck routes designated in permits issued under the provisions of the Excavation, Grading and Fills Ordinance must be in compliance with routes established in this section.

3-2 Dust Control - The control of dust shall conform to the requirements of Section 10, "Dust Control", of the Caltrans Standard Specifications, except as modified herein.

A. Recycled water shall be used in place of potable water and/or dust palliative, unless it is otherwise specified by the Engineer and/or Drawings and Project Specifications.

B. Prior to the use of recycled water, the user must obtain a permit from the City's Regional Water Quality Control Plant and comply with Section 23 of the City's Recycled Water Requirements.

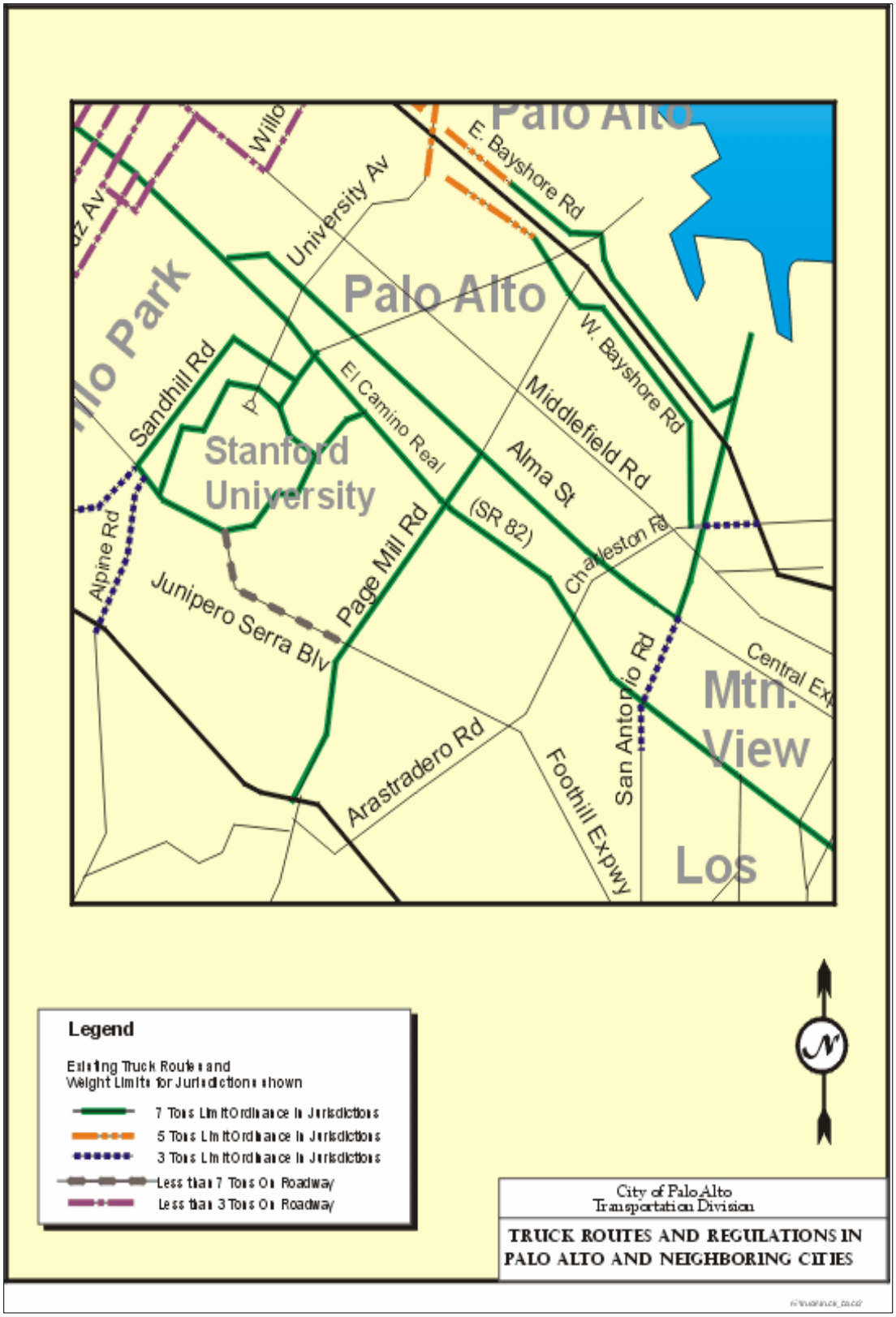
C. Dust control shall be maintained at all times including during non-working Days. The Engineer may, if the dust is considered to be a public nuisance, stop all work until effective dust control is provided. Additionally, if the Contractor fails to remove the nuisance within two hours after the notice of the existence of the nuisance by the Project Manager, the City may order that the work of watering the site be done by others and all expenses incurred in the performance of this work shall be paid by the Contractor.

D. The Contractor is responsible for controlling dust in the project area, whatever the cause, and no separate or additional payment will be allowed.

3-3 Noise Control - The Contractor shall abide by the City's noise control ordinance as contained in the Palo Alto Municipal Code Chapter 9.10. A copy of this ordinance is available in the Palo Alto City Clerk's Office.

3-4 Pollution Control - The Contractor shall not, in connection with the work, discharge smoke, dust or contaminants into the atmosphere or discharge any undesirable fluids or other materials into any storm drain, sanitary sewer, lake, river, stream, well or channel that would have an adverse affect on the environment, as determined by the Engineer, unless

any and all required permits from regulatory agencies have been obtained permitting such discharge. The Contractor shall comply with Section 8, “Stormwater Pollution Prevention”, in these Standard Drawings and Specifications.



END OF SECTION

SECTION 4

SITE MAINTENANCE AND CLEAN-UP

4-1 **General -** Throughout the construction period, the site shall be maintained in a neat and orderly condition at all times in accordance with the provisions contained herein described.

4-2 **Daily Clean-Up -** The project site shall be inspected daily and cleared of all scrap, debris and waste material not required for construction of the work. Any material remaining on site shall be covered with tarps, and comply with Section 8 (stormwater pollution prevention) and other PAMC requirements. Waste material shall be disposed of at an approved and properly permitted and licensed solid waste disposal facility. Garbage, mixed construction and demolition materials, and mixed recycling shall be collected by the City's exclusive waste collection contractor.

4-3 **Excess Material -** Except for recyclable inert solids and building materials as specified in Section 24, "Inert Solids and Building Materials Recycling", of these Standard Drawings and Specifications, excess material excavated may be deposited at a location designated by the Engineer or shall be disposed of properly at a permitted facility. Material to be deposited shall be free of deleterious material.

4-4 **Final Cleaning -** Before final inspection of the work, the Contractor shall clean the project site and all grounds occupied thereby in connection with the work of all rubbish, excess materials, false work, temporary structures, equipment and other items, if directed by the Engineer. All parts of the work shall be left in a neat and presentable condition.

END OF SECTION

SECTION 5

REQUIREMENTS FOR WORK IN CITY RIGHT-OF-WAY

5-1 **Notification -** The Contractor shall give at least one (1) week notice in writing indicating when the initial services of the Engineer are required for laying out any portion of the work. For all subsequent notifications, the Contractor shall provide a minimum of two (2) working days in advance notification.

5-2 **Notification to the City Communications Division of the Police Department -** The contractor shall keep the Communications Division of the Police Department informed daily regarding the location of excavations, barricades and detours in right-of-way areas during work hours. The Contractor shall leave an emergency phone number with the City Communications Division of the Police Department.

5-3 **Notification to Underground Services Alert (USA) -** The Contractor shall notify USA at 811 or (1-800-227-2600) a minimum five (5) working days prior to any excavation in the vicinity of any underground utility lines, unless otherwise stated by City contract. It shall be the sole responsibility of the Contractor to verify the exact location and depth of all utilities prior to excavation.

5-4 **Damage to Existing Utilities** - The Contractor shall bear full responsibility for all damages and costs of repairs to existing utilities.

5-5 **Street Opening Permit -** A street opening permit shall be obtained by the Contractor from the Public Works Department, Engineering Division, for all work in the City right-of-way. This does not apply to City-administered projects.

5-6 **Encroachment Permit -** An encroachment permit shall be obtained by the owner of private improvements, permanent or temporary in nature, placed within the City right-of-way or on City property.

5-7 Work in the public right of way requires an approved traffic control plan from Planning & Community Environment – Transportation Division. Traffic control plans must include items such as pedestrian, bicycle, vehicle detours, as well as additional signage and routing for bicyclists on bicycle boulevards and school routes. Traffic control plan guidelines can be found at:
http://www.cityofpaloalto.org/gov/depts/pln/transit/default.asp.

END OF SECTION

SECTION 6

FIELD SURVEYING

6-1 Construction Staking - Construction staking and cut sheets shall be provided by a Registered Civil Engineer licensed to practice surveying or a Professional Land Surveyor licensed in California.

A. Stakes and marks set by the Engineer shall be carefully preserved by the Contractor.

B. In the case that such stakes and marks are destroyed or damaged by reason of the Contractor's operations, the Contractor shall replace or restore them at the Contractor's expense.

C. The Engineer shall determine the extent of stakes or marks necessary to establish the lines and grades required for the completion of the Work described in the Drawings and Project Specifications.

6-2 Notification – The Contractor shall comply with Section 5, "Requirements for Work in City Right-of-Way", and shall notify the Engineer in writing at least two (2) working days prior to commencing work and shall follow an approved construction schedule.

END OF SECTION

SECTION 7

CLEARING AND GRUBBING

7-1 GENERAL

A. Clearing and grubbing

1. Shall conform to Section 17, "Clearing and Grubbing", of the Caltrans Standard Specifications, except as modified herein.

2. Areas overgrown by trees or other vegetation need to be prepared prior to the impacted construction activity, which may require the removal and maintenance of weeds in landscaped areas within the entire work zone.

B. Trees

1. All trees, or portions thereof, which are within the right-of-way shall remain unless otherwise shown on the Drawings, or the Engineer directs that a tree or trees or portions thereof are to be removed.

   a) If directed by the Engineer, the Contractor shall remove such trees in advance of the construction of the permanent improvement and shall dispose of them as directed.

   b) The trunks of the trees shall be removed to a depth of not less than two (2) feet below grade, and the resulting cavity shall be backfilled and compacted using approved material.

2. Care shall be taken in removing trees to ensure that damage is not done to adjacent improvements. Trees which overhang the right-of-way or the finished Work to within fourteen (14) feet of the pavement and which require trimming may need to be trimmed by the Contractor if directed by the Engineer.

3. All trees and vegetation not indicated for removal shall be protected from damage by the Contractor in accordance with Standard Drawing Number 605 and with Section 26, “Tree Protection”, of these Standard Drawings and Specifications. The Contractor shall be liable for replacement in kind of any such damaged trees and vegetation.

4. All trees shall be trimmed by a certified tree worker or a qualified tree care specialist, according to the City’s Tree Technical Manual available

from the City's Development Center or from the Urban Forestry Section of the Public Works Department website.

5. Tree Branch Trimming

a) Where City street trees obstruct the Contractor's ability to perform the Work, the Contractor shall be responsible for all trimming necessary to create clearance for construction operations. Trees which overhang the right-of-way or the finished Work to within fourteen (14) feet of the pavement and which require trimming may need to be trimmed by the Contractor if directed by the Engineer.

b) When milling, overlay or slurry seal of a street is required, the Contractor shall trim tree branches that extend over the back of curb line to ensure a minimum clearance of fourteen (14) feet.

c) If a cut is to be made on the branch which is larger than four (4) inches in diameter, the City Arborist must be notified prior to any cutting.

d) The schedule for tree trimming must be submitted to the City Arborist in addition to the City Engineer at least one (1) week prior to commencing work.

e) The Contractor shall remove and dispose of all leaves, branches and debris generated as the result of the work at the end of every work day.

C. Pruning of Vegetation

1. When curb and gutter, sidewalk, driveway and walkway replacement is required, the Contractor shall prune vegetation six (6) inches from back of curb and gutter, sidewalk, driveway or walkway.

D. Pruning of Tree Roots

1. Tree roots shall be removed to a depth of twenty-four (24) inches below proposed top of adjacent curb grade.

2. When tree roots are greater than four (4) inches in diameter are encountered, the Contractor shall contact the City Arborist, prior to cutting, for a decision on treatment.

3. Root pruning method shall be approved by the Engineer.

4. Root pruning shall be by Vermeer saw or approved equal. Prior to their removal, roots shall be completely severed between work area and the

tree. Tree roots shall not be torn or ripped by a backhoe or by other means. All final root pruning cuts shall be a clean cut.

5. When demolition exposes roots two (2) inches or greater in diameter, take care to preserve any and all roots not within the grading/excavation plane. Take all reasonable steps as directed to protect exposed roots to remain, such as covering with moistened soil or burlap to prevent drying of live roots.

6. If roots to be cut are within twelve (12) inches of the vertical portion of the tree trunk, the Contractor shall contact the City Arborist, prior to cutting, for a decision on treatment.

7. Contractor shall repair all damaged utility and irrigation lines at no cost to the City. All repairs must be done within seven (7) calendar days.

8. Prevent damage to limbs, trunks and bark. To this end, the Engineer may, from time to time direct the edge or edges of the sidewalk to be realigned away from the tree.

END OF SECTION

SECTION 8

STORMWATER POLLUTION PREVENTION

8-1 GENERAL

A. Throughout the construction period of the project, the Contractor shall practice the Stormwater Pollution Prevention procedures as described in this Section.

B. If the project disturbs one (1) or more acres of soil, then Contractor shall file a Notice of Intent with the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) and comply with Construction General Permit Order 2009-2009-DWQ. Contractor shall develop and implement a Stormwater Pollution Prevention Plan (SWPPP) in accordance with State requirements.

C. For projects disturbing less than one (1) acre of soil, the Contractor must follow the "Pollution Prevention – It's Part of the Plan" plan sheet provided by the City and incorporated herein.

8-2 RELATED WORK

A. Documents affecting work of this section include, but are not necessary limited to, the General Conditions, Supplementary Conditions and of these Standard Drawings and Specifications.

B. In addition to standards described in this section, comply with requirements for cleaning as described in pertinent other Sections of these Specifications.

C. A daily inspection, and more often if necessary, shall be conducted by the Engineer to verify that requirements for cleanliness are being met.

D. In addition to the standards described in this section, the Contractor shall comply with pertinent requirements of other government agencies having jurisdiction over this Work.

8-3 EXECUTION

A. Non-hazardous Material / Waste Management

1. The Contractor shall propose designated areas of the project site, for approval by the Engineer, suitable for material delivery, storage, and waste collection that, to the maximum extent practicable, are near

construction entrances and away from catch basins, gutters, drainage courses, and creeks.

2. Granular Material

   a. The Contractor shall store granular material at least ten (10) feet away from catch basin and curb returns, and shall not be stored within the gutter pan.

   b. The Contractor shall not allow granular material to enter the storm drains or creeks.

   c. When rain is forecast within twenty-four (24) hours, during wet weather, or any time the granular material is not in use, the Contractor shall cover granular material with a tarpaulin and to berm stockpiles of sand, dirt, or other construction materials unless directed otherwise by the Engineer. The Contractor shall prevent tracking or depositing materials onto City streets.

3. The Contractor shall use recycled water to control dust on a daily basis or as directed by the Engineer.

4. Street Sweeping - At the end of each working day or as directed by the Engineer, the Contractor shall clean and sweep roadways and on-site paved areas of all materials attributed to or involved in the work. The Contractor shall not use water to flush down streets in place of street sweeping.

   a. When rain is expected, ensure that material stockpiles are covered, sweep to remove loose debris, and remove filter fabric to reduce potential for street flooding.

5. Contractor shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from site and tracking off site.

6. Recycling

   a. The Contractor shall recycle aggregate base material, asphalt concrete, and Portland Cement Concrete as described in Section 24, “Inert Solids and Building Materials Recycling”, of these Specifications. Only source separated single recyclable materials can be collected by another collector other than the City’s collection

Contractor. “Source separated single recyclable materials” are recyclable materials that are separated from other recyclable materials or solid waste and placed in separate containers according to type or category of materials and directly marketed as a single commodity.

b. In addition, to the maximum extent practicable, the Contractor shall reuse or recycle any useful construction materials generated during the project.

7. Disposal

a. At the end of each working day, the Contractor shall collect all scrap, debris, and waste material, and dispose of such materials properly and ensure dumpsters are covered. City requires that garbage, mixed construction and demolition materials, and mixed recycling be collected by its exclusive waste collection contractor.

b. The Contractor shall inspect dumpsters for leaks and contact trash hauling or collection contractors to replace or repair dumpsters that leak.

c. The Contractor shall not discharge water on-site from cleaning dumpsters.

d. The Contractor shall arrange for regular waste collection before dumpsters overflow.

e. The Contractor shall cover loads that are being transported to or from the site.

B. SPILL PREVENTION AND CONTROL

1. The Contractor shall keep a stockpile of spill cleanup materials, such as rags or absorbents, readily accessible on-site.

2. The Contractor shall immediately contain and prevent leaks and spills from entering storm drains, and properly clean up and dispose of the waste and cleanup materials. If the waste is hazardous, the Contractor shall dispose of hazardous waste only at authorized and permitted Treatment, Storage, and Disposal Facilities, and use only licensed hazardous waste haulers to remove the waste off-site, unless quantities

to be transported are below applicable threshold limits for transportation specified in State and Federal regulations.

3. The Contractor shall not wash any spilled material into streets, gutters, storm drains, or creeks and shall not bury spilled hazardous materials.

4. The Contractor shall report immediately any hazardous materials spill to City of Palo Alto Police Department Dispatch at (650) 329-2413.

5. The Contractor shall place portable toilets away from storm drains and ensure they are in good working order and checked frequently for leaks.

C. VEHICLE / EQUIPMENT CLEANING

1. The Contractor shall not perform vehicle or equipment cleaning on-site or in the street using soaps, solvents, degreasers, steam cleaning equipment, or equivalent methods.

2. The Contractor shall perform vehicle or equipment cleaning, with water only, in a designated, bermed area that will not allow rinse water to run off-site or into streets, gutters, storm drains, or creeks.

D. VEHICLE / EQUIPMENT MAINTENANCE AND FUELING

1. The Contractor shall perform maintenance and fueling of vehicles or equipment in a designated, bermed area or over a drip pan that will not allow run-on of stormwater or runoff of spills.

2. The Contractor shall use secondary containment, such as a drip pan, to catch leaks or spills any time that vehicle or equipment fluids are dispensed, changed, or poured.

3. The Contractor shall keep a stockpile of spill cleanup materials, such as rags or absorbents, readily accessible on-site.

4. The Contractor shall clean up leaks and spills of vehicle or equipment fluids immediately and dispose of the waste and cleanup materials as hazardous waste, as described in Section 8-3.B above.

5. The Contractor shall not wash any spilled material into streets, gutters, storm drains, or creeks and shall not bury spilled hazardous materials.

6. The Contractor shall report any hazardous materials spill to City of Palo Alto Police Department Dispatch at (650) 329-2413.

7. The Contractor shall inspect vehicles and equipment arriving on-site for leaking fluids and shall promptly repair leaking vehicles and equipment. Drip pans shall be used to catch leaks until repairs are made.

8. The Contractor shall recycle waste oil and antifreeze, to the maximum extent practicable.

9. The Contractor shall comply with Federal, State, County and City requirements for storage of hazardous materials in above ground storage tanks.

E. CONTRACTOR TRAINING AND AWARENESS

1. The Contractor shall train all employees/subcontractors on the stormwater pollution prevention requirements contained in these specifications.

2. The Contractor shall inform subcontractors of the stormwater pollution prevention contract requirements and include appropriate subcontract provisions to ensure that these requirements are met.

3. The Contractor shall post warning signs in areas treated with chemicals.

4. The Contractor shall apply a “No Dumping! Flows to [Creek Name]” message on the curb adjacent to all newly constructed catch basins as specified on City Standard Drawing No. 302 and as described below:

   a. Catch basins on private property shall be labeled by painting the message on the adjacent curb, using a stencil available from the Palo Alto Regional Water Quality Control Plant.

   b. Catch basins within the public right-of-way shall be labeled by installing a stainless steel medallion, available from the Public Works Inspector, on the adjacent curb.

F. SPECIFIC REQUIREMENTS

1. Paving Operations

   a. Project Site Management

i. When rain is forecast within twenty-four (24) hours or during wet weather, the Engineer may prevent the Contractor from paving or seal coating to prevent uncured materials from contacting stormwater runoff.

ii. The Engineer may direct the Contractor to protect drainage courses by using control measures, such as earth dike, straw bale, and sand bag, to divert runoff or trap and filter sediment.

iii. The Contractor shall place drip pans or absorbent material under paving equipment when not in use.

iv. The Contractor shall cover catch basins and manholes when paving or applying seal coat, tack coat, slurry seal, or fog seal.

2. Paving Waste Management

a. The Contractor shall not sweep or wash down excess sand (placed as part of a sand seal or to absorb excess oil) into gutters, storm drains, or creeks. Instead, the Contractor shall either collect the sand and return it to the stockpile, or dispose of it in a waste container. The Contractor shall not use water to wash down fresh asphalt concrete pavement.

b. Saw Cutting

i. During saw cutting, the Contractor shall cover catch basins using control measures, such as filter fabric, gravel bags, and fine gravel dams, to keep slurry out of the storm drain system. When protecting a catch basin, the Contractor shall ensure that the entire opening is covered.

ii. The Contractor shall vacuum saw cut slurry and pick up the waste prior to moving to the next location or at the end of each working day, whichever is sooner. The Contractor shall use as little water as possible and properly dispose of residues.

iii. If saw cut slurry enters catch basins, the Contractor shall remove the slurry from the storm drain system immediately.

3. Contaminated Soil Management

   a. On all projects involving grading or excavation, the Contractor shall report to the Engineer contaminated soils as evidenced by site history, discoloration, odor, differences in soil properties, abandoned underground tanks or pipes, or buried debris. If the project is not within an area of known soil contamination and no evidence of soil contamination is found, then testing of the soil shall only be required if directed by the Engineer.

   b. If the project is within an area of known soil contamination or evidence of soil contamination is found, then soil from grading or excavation operations shall be tested. The soil shall be managed as required by the Palo Alto Fire Department and Santa Clara County Environmental Health, or other designated agency. If the project is found to be within an area of soil contamination not identified by the City in the project specifications, a change order shall be negotiated to cover additional work performed by the Contractor.

4. Concrete, Grout, and Mortar Waste Management

   a. The Contractor shall store concrete, grout, and mortar away from drainage areas, and under cover to protect from rainfall and runoff to ensure that these materials do not enter the storm drain system.

5. Concrete Truck/Equipment Wash Out

   a. The Contractor shall not wash out concrete trucks or equipment into streets, gutters, storm drains, or creeks.

   b. The Contractor shall perform washout of concrete trucks or equipment off-site or in a designated area on-site where the water will flow into a temporary waste pit and make sure wash water does not leach into the underlying soil. (See California Stormwater Quality Association (CASQA) Construction BMP Handbook for properly designed concrete washouts.

6. Exposed Aggregate Concrete Wash Water

   a. The Contractor shall avoid creating runoff by draining water from washing of exposed aggregate concrete to a dirt area. If a suitable dirt area is not available, then the Contractor shall drain wash down

to a bermed surface where it can be pumped and disposed of properly. It may not enter the storm drain system.

b. The Contractor shall collect and return sweepings from exposed aggregate concrete to a stockpile or dispose of the material in a designated waste container.

G. Fiber rolls

1. Standard Drawing 332 - Typical Fiber Roll Installation.

2. Materials

a. Fiber rolls should be either prefabricated rolls or rolled tubes of erosion control blanket with a minimum diameter of eight (8) inches.

3. Installation

a. Slope inclination of 4:1 (H:V) or flatter, fiber rolls should be placed at a maximum interval of twenty (20) feet. Slope inclination between 4:1 and 2:1 (H:V), fiber rolls should be placed at a maximum interval of fifteen (15) feet. Slope inclination of 2:1 or greater (H:V), fiber rolls should be placed at a maximum interval of ten (10) feet.

b. Stake fiber rolls into a two (2) to four (4) inch deep trench with a width equal to the diameter of the fiber roll. Drive stakes at the end of each fiber roll and spaced four (4) feet maximum on center. Use wood stakes with a nominal classification of ¾ by ¾ inch and minimum length of twenty-four (24) inches.

4. Cleanup

a. Collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions or any other ground disturbances to blend with adjacent ground.

b. Ensure that all storm drain inlet filter fabric or other materials are removed once construction is complete.

END OF SECTION

SECTION 9

EARTHWORK

9-1 GENERAL

A. Earthwork shall consist of performing all operations necessary as described in Section 19, "Earthwork", of the Caltrans Standard Specifications and as described in the following provisions with the exception that no blasting of any kind whatsoever shall be allowed unless specifically authorized by the Engineer. The work governed by this Section shall consist of performing all operations necessary for roadway and site excavation, structural excavation and backfill, ditch excavation, compaction, embankment construction and borrow excavation.

9-2 EXECUTION

A. Surplus Materials

1. Surplus material shall be disposed of by the Contractor unless directed otherwise by the Engineer. The Contractor's attention is directed to Section 24, "Inert Solids and Building Materials Recycling", of these Standard Drawings and Specifications for inert solids recycling requirements.

2. The Contractor must conform to the applicable provisions of Chapter 5.20 and Chapter 5.24 of the Palo Alto Municipal Code when disposing of surplus materials.

B. Excavation and Backfill for Structures

1. Excavation for structures shall conform to the provisions of Section 19 of the Caltrans Standard Specifications, except that surplus material shall be disposed of as provided in Section 9-2 above.

2. Backfill for structures shall conform to the provisions of Section 19-3.06 of the Caltrans Standard Specifications.

C. Topsoil

1. Topsoil shall be clean, free from rocks and free from weeds or other foreign matter. Use of on site or imported material for topsoil shall be subject to approval of the Engineer.

END OF SECTION

SECTION 10
SUBGRADE

10-1 GENERAL

A. Construction of the subgrade shall conform to Section 25-1.03, "Subgrade", of the Caltrans Standard Specifications, except as modified herein.

B. In advance of constructing embankments or depositing a specified layer of roadbed material, a minimum six (6) inch layer of the existing native ground shall be stripped and removed as directed by the Engineer.

1. Additional existing material within the area which, in the opinion of the Engineer, is unsuitable as a foundation for the embankment (including but not limited to organics, expansive clays, or other deleterious materials either on or beneath the surface) shall be removed, disposed of and the resulting space refilled with approved material.

C. All rocks or solid lumps of material over two-and-one-half (2-1/2) inches in greatest dimension shall be removed from the upper six (6) inches of the graded roadbed and the resulting spaces refilled with approved material.

D. When unsuitable material is removed and disposed of and the resulting space refilled with approved material as specified, the approved material shall be placed and compacted in layers in accordance with the applicable requirements as specified in Section 9, "Earthwork", of these Standard Drawings and Specifications.

E. The native material upon which embankments are to be constructed, for a depth of not less than six (6) inches below finished subgrade, and for a width equal to the width of the proposed surfacing or other improvements plus three (3) feet beyond on all sides shall be scarified and recompacted to not less than 95 percent relative compaction.

F. The surface of the finished subgrade at any point shall not vary by more than 0.05 foot above or below the subgrade elevation established by the approved Drawings.

G. Continuous hauling over newly prepared subgrade which will cut or deform it from the required cross-sectional grade will not be permitted.

1. The Contractor shall be financially responsible for all repairs for any damage to the subgrade caused by the Contractor's operations or by use of public traffic.

2. No additional material shall be placed upon the subgrade until the subgrade is tested for compaction and is approved by the Engineer.

END OF SECTION

SECTION 11

AGGREGATE SUBBASE

11-1 GENERAL

A. This work shall consist of furnishing, spreading and compacting aggregate subbase in conformance with Section 25, "Aggregate Subbases", of the Caltrans Standard Specifications and in conformance with the lines, grades and dimensions shown on the Drawings and typical cross-sections except as modified herein.

B. The relative compaction of each layer of compacted subbase material shall be not less than 95 percent.

C. The surface of the finished subbase shall not vary more than 0.05 foot above or below the grade established by the Engineer.

END OF SECTION

SECTION 12

AGGREGATE BASE

12-1 GENERAL

A. This work shall consist of furnishing, spreading and compacting Class 2 aggregate base as detailed in Section 26, "Aggregate Bases", of the Caltrans Standard Specifications and in conformance with the lines, grades and dimensions shown on the Drawings and typical cross-sections, except as modified herein.

B. The relative compaction of each layer of compacted base material shall be not less than 95 percent.

C. The surface of the finished base shall not vary more than 0.05 foot above or below the grade established by the Engineer.

END OF SECTION

SECTION 13

ASPHALT CONCRETE

13-1 GENERAL

A. Asphalt concrete shall conform to Section 39, "Asphalt Concrete", of the Caltrans Standard Specifications except as modified herein.

13-2 PRODUCTS

A. Prime Coat

1. The liquid asphalt for prime coat shall conform to Section 92 "Asphalt Binders" of the Caltrans Standard Specifications and shall be Performance Graded PG 64-10.

B. Paint Binder

1. The asphaltic emulsion for paint binder shall conform to Section 94, "Asphaltic Emulsions", of the Caltrans Standard Specifications and shall be Grade SS-1.

C. Asphalt Concrete

1. Asphalt concrete shall be Type B and shall be of the thickness as shown on the Drawings. Aggregate grading shall be the following:

AC Layer	Aggregate Grading
Surface Course (Pavement)	1/2" maximum, medium
Leveling Course	3/8” maximum
Patches, Trenches, Valves & Manholes	3/8" maximum
Base Repair Course	3/4" maximum, medium
Skin Patching	¼” fine

2. The surface layer of asphalt concrete shall not exceed two-and-one-half (2-1/2) inches and not be less than one-and-one-half (1-1/2) inches in compacted thickness. Asphalt binder to be mixed with aggregate shall be PG 64-10 steam-refined paving asphalt conforming to the provisions of Section 92, "Asphalt Binders", of the Caltrans Standard Specifications.

13-3 EXECUTION

A. Prime Coat - Liquid asphalt shall be furnished and applied as a prime coat on a prepared subgrade at the locations shown on the Drawings or as directed by the Engineer. The prime coat shall be applied at the approximate rate of 0.25 gallons per square yard of surface covered. Sand cover shall be applied at driveways, in intersections and to the roadbed surface where continuous traffic access must be maintained.

B. Paint Binder - A paint binder of asphaltic emulsion shall be furnished and applied in accordance with the provisions of Sections 39 and 94 of the Caltrans Standard Specifications and shall be applied to all vertical surfaces of existing pavement, curbs, gutters and construction joints in the surfacing against which additional material is to be placed, to horizontal surfaces including planed surfaces, HMA and PCC, and to other surfaces designated by the Engineer. Paint binder shall be applied in one application at a rate of 0.05 gallons per square yard of surface covered or at a rate established by the Engineer.

C. Asphalt Concrete

1. Spreading and Compaction - The edge of the existing pavement shall be trimmed to a neat line and the surface course of the new paving shall be joined to the existing paving by wedge cutting. This edge of the existing pavement shall be wedge cut to a neat line and swept prior to application of the new surface course.

2. Spreading and compaction equipment and operations shall conform with the provisions of Sections 39-2, "Spreading and Compacting Equipment"; 39-2, "Spreading and Compacting" and 39-2, "Miscellaneous", of the Caltrans Standard Specifications, unless otherwise specified. The Contractor and the Engineer will come to an agreement two (2) working days in advance of any paving operation regarding the pass widths, the establishment of control to maintain uniform grade, and the compaction equipment and procedures to be used.

3. Segregation shall be avoided, and the surfacing shall be free of lumps and pockets of coarse or fine material. The final lift shall be spread by an asphalt concrete paver which is a self-contained and self-powered unit with an activated screed capable of spreading and finishing an asphalt concrete mixture to the required thickness true to the line, grade and crown required. The complete surfacing shall be thoroughly compacted, smooth, true-to-grade and free from ruts, humps, depressions or other irregularities.

4. Grade Tolerance - The surface tolerance for the surface course shall be as specified in Section 39-2, "Compacting", of the Caltrans Standard Specifications.

5. Conforms - Asphalt concrete conforms shall receive a sand seal coat as required for public conveyance.

D. Saw-cutting - At all locations where new asphalt will be installed to abut existing asphalt, the existing asphalt shall be saw-cut to conform to the line of abutment, such cutting shall be done in such a manner that spalling and cracking of the existing asphalt which is to remain in place is avoided. All damaged existing asphalt which is to remain in place shall be replaced at the Contractor's expense. The saw-cut shall be to the full depth of the existing asphalt.

E. At locations where new asphalt abuts existing asphalt, a two (2) foot wide oil and sand seal shall be placed, with one (1) foot on the existing pavement and one foot on the new pavement, the same day the street is resurfaced. Excess sand shall be removed immediately.

F. The disposal of materials and/or slurry from saw-cutting shall conform to Section 3-4, Pollution Control and Section 8, “Storm Water Pollution Prevention”, of the Standard Drawings and Specifications.

END OF SECTION

SECTION 14

ADJUSTMENT OF EXISTING MANHOLES, MONUMENTS, VALVE BOXES, AND ELECTRICAL VAULTS

14-1 GENERAL

A. All existing manhole frames, valve boxes, and monument boxes, as well as those to be installed as an item of Work under the Contract, shall be set to finished grade of the new Work after surfacing operations unless directed otherwise in the Project Specifications or by the Engineer.

B. New Electrical Vault shall be installed per Utility Electrical Standard Specifications. All existing electrical vault shall set to finished grade of the new Work after surfacing operations as follow:

DIRECTION OF TRAVEL	**GROOVES**	**STEPS**
Parallel to travel	No more than 12 mm (0.47”) wide	No more than 10 mm (0.39”) high
Perpendicular to travel	----------	No more than 20 mm (0.78”) high

The Contractor shall contact Electrical Utility Inspector at 650-566-4500 to schedule the Electrical Vault adjustment five (5) working days prior to the work.

C. Measures must be taken to not disturb monuments, the City Surveyor must be notified if a monument is disturbed.

D. When resetting manholes or trash capturing device openings, a device such as the “Debris Catcher” from Grappler Specialty Products or approved equal shall be installed to recover any fallen materials to prevent debris from entering the sewer or storm drain system.

14-2 PRODUCTS

A. All raised or adjusted utilities shall receive a gasket type seal, such as “Rap-o-Rope” braided rubberized gasket or equivalent to be approved by the Engineer. Gaskets may be available from the following suppliers: Pollard Water (1-800-437-1146), Parsons Environmental (1-800-356-9023), and C.A. Turner Company (1-800-228-4032). This list is not exhaustive.

14-3 EXECUTION

A. Frames and boxes shall be set in Class 2, 3500 psi, concrete. The concrete shall be held two (2) inches low in areas to be paved with three-eighths (3/8) inch max medium asphalt concrete.

END OF SECTION

SECTION 15

CONCRETE STRUCTURES

15-1 GENERAL

A. Concrete structures shall be constructed in accordance with the appropriate provisions of Section 51, "Concrete Structures", of the Caltrans Specifications, except as modified herein.

15-2 RELATED WORK

A. Saw-cutting

1. At all locations where new concrete will be installed to abut existing concrete and the plans show that the existing concrete shall be saw-cut to conform to the line of abutment, such cutting shall be done in such a manner that spalling and cracking of the existing concrete which is to remain in place is avoided.

2. All damaged existing concrete which is to remain in place shall be replaced at the Contractor's expense. The saw-cut shall be to the full depth of the existing concrete.

B. The disposal of materials and/or slurry from saw cutting shall conform to Section 3-4, “Pollution Control”, and Section 8, “Stormwater Pollution Prevention”, of the Standard Drawings and Specifications.

END OF SECTION

SECTION 16

CONCRETE CURBS, GUTTERS, VALLEY GUTTERS, SIDEWALKS, DRIVEWAYS, CURB RAMPS AND STREETS

16-1 GENERAL

A. Unless otherwise specified, streets and valley gutters shall be constructed of Class 2 concrete and concrete curbs, gutters, sidewalks, driveways and curb ramps shall be constructed of Minor Concrete per Caltrans Section 40, "Portland Cement Concrete Pavement"; Section 73, "Concrete Curbs and Sidewalks" and Section 90, "Portland Cement Concrete", of the Caltrans Standard Specifications, except as modified herein. Class 2 concrete shall contain eight (8) sacks of cement per cubic yard and shall provide a minimum compressive strength of 4,500 pounds per square inch at twenty-eight (28) days. Minor Concrete shall contain six (6) sacks of cement per cubic yard and shall provide a minimum compressive strength of 3,500 pounds per square inch at twenty-eight (28) days.

B. For all concrete work in Barron Park, refer to the City of Palo Alto's "Barron Park Drainage and Street Design Guidelines". The document is available upon request from Public Works Engineering at 650-329-2295.

16-2 PRODUCTS

A. Adhesives

1. Adhesives for bonding new Portland cement concrete to existing Portland cement concrete, attaching metal anchors (dowels) to concrete holes, and any other use as directed by the Engineer shall conform to Section 95, "Epoxy", of the Caltrans Standard Specifications.

B. Lampblack

1. Lampblack shall be of an approved quality mixed at the rate of two (2) pints of liquid per cubic yard of concrete for sidewalks, curbs, gutters, streets and driveway aprons. Lampblack shall be omitted from island and median concrete.

2. Valley Gutter concrete work in Barron Park shall receive eight (8) pints of liquid lamp black per cubic yard.

C. Dowels

1. Dowels shall be either A36 steel, grade 60, #4 rebar or smooth coated dowels epoxied in place with slip covers twelve (12) inches long

D. Cement

1. Cement shall be “Type II Modified” in accordance with Section 90, “Portland Cement Concrete”, of the Caltrans Standard Specifications.

E. Water

1. Water shall be clean, free from injurious amounts of oil, alkali, organic matter or other deleterious material and shall be in accordance with Section 90, “Portland Cement Concrete”, of the Caltrans Standard Specifications.

F. Aggregates

1. Aggregates shall be free from deleterious coatings, clay balls, roots, bark, sticks, and other extraneous material and shall be in accordance with Section 90, “Portland Cement Concrete”, of the Caltrans Standard Specifications.

2. Gradation shall be Combined Aggregate Grading in accordance with Section 90, “Portland Cement Concrete”, of the Caltrans Standard Specifications.

3. Class 2 Aggregate Bases and Sub-bases shall be in accordance with Caltrans Standard Specifications Section 25 and 26.

G. Admixtures

1. Admixtures shall be approved by the Engineer. Contractor needs to submit the mix design for review and approval.

2. Admixtures shall be in accordance with Section 90, “Portland Cement Concrete”, of the Caltrans Standard Specifications.

H. Curing Concrete

1. Curing methods and curing compounds shall be in accordance with Section 90, “Portland Cement Concrete”, of the Caltrans Standard Specifications.

I. Metal reinforcement bar #4

1. Unless otherwise specified, reinforcement bar shall be deformed bar A36 steel, grade 60, #4 in accordance with Section 52, “Reinforcement”, of the Caltrans Standard Specifications.

J. Steel Bollards

1. Standard Drawing 702 – Installation of Steel Bollard

2. Standard Drawing 703 – Installation of Removable Steel Bollard

K. Detectable Warning Surface

1. The detectable warning surface (panel) shall be "Armor-Tile" or an approved equal. Color shall be yellow conforming to Federal Standard 595B, color number 33538 at all yellow crosswalks and shall be dark grey, color number 36118 at all other locations. Where dark grey panels do not provide the required contrast ratio with the existing concrete, yellow panels shall be used. When completing an intersection, the color of the new panels shall match the existing panels, or as determined by the Engineer or Inspector. Color substitutions during construction may be made at the discretion of the Engineer. (Note: This provision is not intended to mandate the replacement of existing yellow panels.)

16-3 EXECUTION

A. In all locations of new concrete work including where old concrete is being replaced, the Contractor shall place a minimum of six (6) inches Class 2 aggregate base unless otherwise stated by the Engineer in writing. Less than six (6) inches of existing base material shall not be acceptable. Excavate, re-grade, provide and install additional base as necessary to obtain six (6) inches minimum. Before placing new base or replacing existing material, subgrade material shall be compacted to minimum of 90% relative compaction. The base shall be compacted to a minimum of 95% relative compaction as determined by ASTM Tests D1557, D2922 and D3017.

B. All gutters, including valley gutters, concrete curb and gutter shall be constructed monolithically. Valley gutter, curb and gutters shall be constructed at least seven (7) days prior to paving operations. The Contractor shall verify grades and locations of the valley gutters, curb and gutter. Any discrepancies in the proposed grades versus the actual conditions shall be reported to the Engineer in writing before the affected work is performed. All gutters shall drain properly at the time of final

acceptance of the Work, and it shall be the responsibility of the Contractor to correct any deficiencies.

C. Where concrete sidewalk is adjacent to the curb and gutter, it shall be poured monolithically with the curb and gutter unless directed otherwise by the Engineer.

D. The Contractor shall adjust all existing and new gas and water meter, sewer cleanouts and valve boxes, vent castings and other service castings within the limits of the Work to exact grade at the time concrete improvements are being constructed, and shall maintain these appurtenances to a true and exact grade until the concrete is thoroughly set.

E. The Contractor shall restore any irrigation and special surface treatments encountered in the execution of this work to an equivalent or better condition that existed prior to the commencement of work. The above shall include but not be limited to brickwork, painting of curbs by the designated colors that pre-existed, address painted on curb (white background with black numbers). All marks/stamps indicating sanitary sewer services "S" removed shall be replaced, other utilities stamps such as gas "G" and water "W" do not need to be replaced.

F. Where utility poles, fire hydrants, catch basins or other appurtenant structures lie within the limits of Work, the Contractor shall provide a one-half (1/2) inch preformed expansion joint around such items neatly formed to correspond with the surface of the finished concrete.

G. Where electroliers are located in back of a sidewalk, expansion joint material shall be placed at the back of the walk between the sidewalk and the electrolier base. Bases for electroliers shall be completely separated from the sidewalk by felt roofing paper.

H. Unless otherwise specified, rebar #4 shall be installed in all valley gutters, eighteen (18) inches on center, both ways, longitudinal rebars shall be twelve (12) inches on center if valley gutter is three (3) feet in width. Refer to Standard Specifications Drawings 131, 132, 132A, 132B – Valley Gutter.

I. No concrete shall be placed until the forms have been checked by the Engineer. No concrete shall be placed when the ambient air temperature is below 40° F or during rain.

J. As soon as the concrete is set, it shall be cured for a period of at least seventy-two (72) hours by applying a suitable cover that will keep all exposed surfaces continually damp or by spraying with an approved impervious membrane curing compound.

K. A water flow test will be required to detect depressions in the new gutter during finishing of the concrete.

L. Curb ramps conforming with the Standard Drawings and Specifications shall be constructed at all new curb returns and other locations specified on the plans or directed by the Engineer.

M. Curb ramps shall have a detectable warning surface that extends the full width and three (3) feet depth of the curb ramp. The edge of the detectable warning surface nearest the street shall be between six (6) inches and eight (8) inches from the gutter flowline. Curb ramps with detectable warning surface shall follow Caltrans Standard Plans, Curb Ramp Details No. A88A and Specifications. Refer to Standard Specifications Drawings 101 through 105 for details.

N. For retrofit conditions, not limited to removal and replacement of curb apron shall be approved by the Engineer prior to construction. The detectable warning surface shall be flush with the surrounding surface.

O. Existing concrete improvements shall be saw-cut to full depth at concrete conforms unless specified otherwise by the Engineer. At all locations where new concrete will be installed to abut existing concrete and the plans show that the existing concrete shall be saw-cut to conform to the line of abutment, such cutting shall be done in such a manner that spalling and cracking of the existing concrete which is to remain in place is avoided. All damaged existing concrete which is to remain in place shall be replaced at the Contractor's expense. The saw-cut shall be to the full depth of the existing concrete.

P. Install dowels between all new and existing concrete. Dowels shall be twelve (12) inches long, installed two (2) feet on center, beginning six (6) inches from each saw cut edge of trench or opening.

Q. Gutter pans transitioning from three (3) feet wide to two (2) feet wide shall have a transition zone of six (6) feet. Refer to Standard Drawing 142 – Curb Transitions.

END OF SECTION

SECTION 17

BORING, TRENCHING, POTHOLING, AND DEWATERING

17-1 GENERAL

A. Boring

1. The scope of this Work shall include boring of conduit and surface restoration. Conduit shall be installed in accordance with Standard Drawing number 402.

B. Trenching

1. The scope of this Work shall include trench excavation, backfill and surface restoration, and shall be in accordance with Standard Drawing numbers 401, 403 and as included herein.

C. Trench Plates

1. The scope of this Work shall include trench plates and shall be in accordance with Standard Drawing number 404-405.

D. Potholing

1. The scope of this Work shall include potholing, backfill and surface restoration. The contractor shall be required to pothole all utilities by hand digging or core drilling and vacuum methods in every intersection crossing the excavation or boring alignment. The Contractor shall pothole as necessary to determine the exact locations of pipes in critical situations prior to or during construction. Critical situations shall be defined by the Engineer.

2. Where connecting to or crossing existing underground utilities, the Contractor shall uncover these utilities and verify the locations and elevations prior to performing any installation Work within one-hundred-fifty (150) feet of these locations.

E. Existing Utilities

1. The location of existing utility mains and lateral lines including storm drain, sanitary sewer, water, gas, underground electrical and communication conduits crossing the trench excavation shall be verified by the Contractor. The Contractor shall be responsible for notifying Underground Services Alert (USA) at 811 or 800-642-2444 at least five (5) working days prior to beginning underground work so that existing utilities can be marked in the field, unless otherwise stated by City contract.

Contractor shall expose all crossing utilities ahead of any boring or trench operations.

2. Any existing utility cut or damaged, including but not limited to during potholing or trenching operation shall be called to the attention of the Engineer. Remedial measures required due to the Contractor's action shall be at the Contractor's expense. All exposed utility mains and lateral lines shall be backfilled in accordance with Standard Drawing, number 401. Exposed gas mains require inspection by the Engineer prior to backfilling.

F. Design Plans

1. The City may require design plans to include an engineering plan and profile of each street block, showing the location of existing underground utilities in the proposed path of the conduit installation. These plans shall also show the location of the proposed conduit relative to the nearest utilities maintaining a minimum clearance of twelve (12) inches.

2. The design plans shall also include the approximate locations and dimensions for surface restoration. All boring and trenching is subject to the City's Trench Cut Fee per the City's ordinance.

G. Safety, Bracing and Shoring

1. Excavations shall be supported and excavation operations conducted in accordance with the rules of the California Occupational Safety & Health Administration (OSHA). If in the opinion of the Engineer, there exists a situation of imminent danger to the workers, the Engineer may order the work stopped and the contractor shall comply with rules of the California Occupational Safety & Health Administration (OSHA).

H. Street Cut Fee

1. The Contractor shall pay to the City a street cut fee to recover the increased repaving and reconstruction costs incurred by the City that are reasonably attributable to the impact of excavation in City streets. See the City's Municipal Fee Schedule for street cut fees.

I. Five-Year Moratorium

1. In order to maintain structural integrity and minimize pavement degradation from the effects of utility cuts, the City has implemented a five (5) year moratorium on cutting or opening all new pavement surfaces. After any street

has been constructed, reconstructed, paved, or overlayed by City crews, under City contract, or under permit, the pavement shall not thereafter be cut or opened for a period of five years.

The City Engineer may grant exemptions to this restriction to facilitate private development on adjacent properties or for emergency repairs. The City may impose conditions deemed necessary to the restoration of the pavement surface when granting exemptions, which may include requiring the repair of base/sub-base, and grinding and repaving up to the full-width of the pavement surface.

All utility cuts performed on pavement that has been slurry sealed or microsurfaced within the past two years shall be slurry sealed or microsurfaced after trench restoration has been completed. The length and width of the required patch work shall be dependent on the length and width of the trench and its proximity to adjacent features such as lane lines and gutters, as determined by the City Engineer.

17-2 RELATED WORK

A. Refer to Section 3 for Temporary Controls and Section 5 for Requirements for Work in City Right of Way and Stormwater Pollution Prevention per City Standard Specification Section 8.

B. Refer to “Asphalt Concrete” in Section 13 and “Concrete” in Section 16 for pavement materials.

C. Refer to City of Palo Alto Utilities Department Water, Gas and Wastewater Utility Standards and the Electric Service Requirements Manual for design and construction of all water, gas, wastewater, and electrical utility facilities.

D. Refer to Standard Drawing number 403 for trench limits of restoration.

E. Refer to Tree Restriction Zones and Tunneling and Directional Boring in the Tree Technical Manual (TTM) Section 2.20.C and Section 2.20.D.

17-3 PRODUCTS

A. Backfill for Boring

1. Backfill shall be sand or granular material falling within the limits described in the Standard Drawing 401. Aggregate base, asphalt concrete, Portland cement concrete shall conform to the requirements within these specifications.

2. The use of controlled density fill (CDF) is permissible provided the specifications have been approved by the Engineer.

B. Boxes

1. Vaults or other service boxes shall be located within the sidewalk unless the Engineer approves an alternative location. Boxes and lids must be AASHTO H20 traffic-rated and have the approval of the Engineer.

C. Backfill for Trenching

1. Improved Areas

a. Initial backfill (pipe zone) and subsequent backfill shall be sand or granular material falling within the limits described in the Standard Drawing, number 401. Aggregate base, asphalt concrete, Portland cement concrete, and reinforcing fabric shall conform to the requirements within these Specifications.

2. Unimproved Areas

a. Initial backfill shall be as above and subsequent backfill may be native soil.

D. Conduit

1. All conduits shall be per the City of Palo Alto Utilities Department Water, Gas and Wastewater Utility Standards and the Electric Service Requirements Manual.

E. Dowels

1. Dowels shall be twelve (12) inches long and either A36 steel, Grade 60 #4 rebar or smooth coated dowels epoxied in place with slip covers.

F. Trench Plates

1. Steel plates shall have a surface that was manufactured with a nominal Coefficient of Friction (COF) of 0.35 as determined California Test Method 342.

2. For ADA compliance, all cutback or premix around trench plate shall be placed so there will be a 12:1 slope to allow for disabled access.

3. A maximum of three-hundred (300) feet or one (1) City block of trench, whichever is greater, may be opened at one time. Refer to Standard Drawing number 404-405 – Trench Plates for further details.

4. Refer to Section 17-4 C and Drawing 405 for special cases where recessed trench plates are required.

G. Backfill for Core Drilled Potholing

1. Asphalt Concrete & Asphalt Overlayed Portland Cement Concrete Streets - Backfill for core drilled potholing shall be twelve (12) inches of sand above the pipe or conduit then fill the holes with Control Density Fill as described per Specifications Section 17-4F4b – Controlled Density Fill (CDF) and cap with two (2) inches of three-eighths (3/8) inch mix of Asphalt Concrete per Specifications Section 13 – Asphalt Concrete.

2. Portland Cement Concrete (PCC) Streets – Backfill for core drilled potholing shall be twelve (12) inch of sand above the pipe or conduit then fill the holes with be Control Density Fill as described per Specifications Section 17-4F4b - CDF to the surface of the PCC street and finished to meet the existing street pavement.

17-4 EXECUTION

A. Conduit

1. The Contractor shall install the conduit in accordance with the approved street work permit. All conduits shall be installed underground using directional boring method. Micro-tunneling or other methods shall be approved by the Public Works Engineering Division. The conduits shall be installed with tracer wire approved by the Engineer per City of Palo Alto Utilities Department Water, Gas and Wastewater Utility Standards. Refer to Standard Drawing 402.

B. Trench Excavation

1. The Contractor shall remove the necessary pavement, excavate to the lines and grades shown on the drawings, place and maintain all required temporary steel plating for traffic; sheeting, shoring, and bracing of all trench excavations; if dewatering is necessary, disposing of all drainage or ground water per Specifications Section 17-4B6 – Dewatering Operations.

2. Excavations in the street shall be performed in such a manner as to prevent unnecessary damage to streets, sidewalks, landscaping, street trees (see Section 26 – Tree Protection) and other existing improvements or underground utilities.

3. The Contractor shall remove any water seepage into trench excavation by furnishing and operating appropriate pumps. Refer to Specifications Section 17-4B6 – Dewatering Operations.

4. Trenches shall not be left open at the end of the day. Adequate provisions shall be made for the placing of temporary steel plates in addition to barricades, signing and lighting. Stockpiling of excavated material within the public right-of-way shall not be allowed. A maximum of three-hundred (300) feet or one (1) City block of trench, whichever is greater, may be opened at one time. For temporary patching, a minimum thickness of two (2) inches of cutback will be used.

5. The Contractor shall notify and receive approval from the Engineer for the removal of any areas of unsuitable soil material along the trench bottom in order that an approved select granular backfill material may be placed. This authorized work shall be paid for as extra work in accordance with these specifications.

6. Dewatering Operations

    a. Sediment Control

        1. The Contractor shall follow the City's Guidelines for Dewatering During Basement or Below Ground Garage Construction, and when permitted route water through a control measure, such as a sediment trap*, sediment basin, or Baker tank, to remove settle-able solids prior to discharge to the storm drain system.

        2. Approval of the control measure shall be obtained in advance from the Engineer.

        3. Filtration of the water following the control measure may be required on a case-by-case basis.

        4. If the Engineer determines that the dewatering operation would not generate an appreciable amount of settleable solids, the control measure requirement in 1) above may be waived.

        5. The Contractor shall reuse water for other needs, such as dust control or irrigation, to the maximum extent practicable.

    b. Contaminated Groundwater

        1. If the project is within an area of known groundwater contamination, then water from dewatering operations shall be tested prior to discharge. If the water quality meets the Palo Alto Regional Water Quality Control Plant (PARWQCP) approval, then it may be discharged to the storm drain. If the water quality meets City of Palo Alto Municipal Code section 16.09.110, then it may be discharged to the sanitary sewer

with prior approval from the Palo Alto Regional Water Quality Control Plant. Otherwise, the water shall be treated or hauled off-site for proper disposal.

2. If the project is not within an area of known groundwater contamination, then monitoring shall only be required if directed by the Engineer. The Contractor shall follow section 17-4B6b above, if contamination is found.

3. If the project is found to be within an area of groundwater contamination not identified by the City in the project specifications, a change order shall be negotiated to cover additional work performed by the Contractor.

* See *California Stormwater Best Management Practice Handbook - Construction Activity* and *Regional Water Quality Control Plant Handbook – Dewatering from Construction Sites and In-Ground Utilities Maintenance Project*.

C. Trench Plates

1. Temporary steel plates over trench openings shall be removed within fourteen (14) calendar days after placement. If steel plates are not removed within fourteen (14) calendar days after placement, a penalty may be imposed as determined by Public Works Engineering.

2. Trench plates installed along Class I & II bike lanes, bike boulevards, arterial roadways, or along roads with a posted speed limit of 35 MPH or greater shall be set flush with the surrounding asphalt concrete surface. This requirement does not apply to PCC surfaced streets. See Standard Drawing Number 405.

3. Trench plates installed in Class I & II bike lanes, and bike boulevards shall be skid resistant and have a reflective coating or tape for additional safety, and shall be set flush with the surrounding asphalt concrete surface (Refer to Standard Drawing 405). Additional warning signage shall be posted on Type II flashing barricades.

D. Trench Plate General Notes

1. Steel plates must be able to withstand H-20 traffic load without any movement.

2. Steel plates must meet ASTM A36 steel requirements (min).

3. When two or more plates are used, the plates shall be tack welded together, metal connectors shall be used only with prior approval from the Engineer.

4. Steel plates shall resist bending, vibration, noise, etc., and anchored to resist movement under traffic loads. If these conditions are not met, daily backfill and paving of excavation will be required.

5. All steel plates shall be properly marked with the utility and contractor name, and after-hours contact phone number in the event the plates need to be secured. Alternatively, this information can also be prominently posted on a barricade.

6. All steel plates within the right-of-way, whether used in or out of the traveled way, shall be without deformation. The plate surface must not deviate more than 1/4" when measured with a 10-foot straight edge along the length of the plate.

7. It is the responsibility of the permittee to perform and document daily inspections of all active plate(s) or unattended plate(s) location(s), and where necessary take appropriate measures to protect the public safety until work is completed. This documentation shall be available to the City inspector upon request. No un-plated excavation shall be left unattended overnight.

8. In the event of improper installation of the steel plates that presents a nuisance or a public safety problem, the permittee shall respond to all excavation restoration requests by the City immediately upon notification. Non-responses will result in the required restoration work being done by the City, with all expenses to be paid by the permittee.

9. Steel plates must extend a minimum of 12-inches beyond the edges of the excavation. Contractor shall follow steel plate manufacturer's recommendation.

10. Steel plate thickness must be minimum 1", and increases to 1-1/4" for 5-foot wide trench. Steel plate for trench widths greater than 5 feet shall require a special structural design.

11. Before steel plates are installed, the excavation shall be adequately shored to support the bridging and traffic loads.

12. Temporary paving with a cold asphalt mix should be used to feather the edges of the plate to form a wedged taper to cover the edges of the steel plate. Other alternative methods to accomplish this will be considered for approval.

13. Wedges or other non-asphaltic devices shall be used for leveling as required to eliminate rocking of the plates. Compacted temporary asphalt shall be used to fill all gaps between the plates and existing pavement surfaces.

14. Contractor shall install "STEEL PLATE AHEAD" sign in advance of all temporary steel plates used on roadways open to vehicular/bicycle traffic.

E. Saw-Cutting or Milling

1. Prior to excavation of trenching, potholing or sending/receiving pits, the asphalt concrete or Portland cement concrete shall be cut or mill to a neat line full depth with a saw-cutting or milling device approved by the Engineer.

2. The edge of excavations broken during construction shall be saw-cut or mill neatly and removed before surface restoration. Saw-cutting or milling details are shown in Standard Drawing Number 401.

3. The disposal of materials and/or slurry from saw-cutting or milling shall conform to Section 8-3, “Stormwater Pollution Prevention”, of these Standard Drawings and Specifications.

F. Backfill

1. Backfill material shall be compacted to 90 percent minimum relative compaction except the top twenty-four (24) inches, which shall be mechanically compacted to 95 percent minimum relative compaction. Mechanically compacted lifts using alternative equipment, complying with manufacture’s specification, will require the approval of the Engineer. Use of alterative compaction equipment shall not relieve the Contractor from responsibility for any damage to the conduit, surrounding ground, or existing and new improvements.

2. Initial Backfill - The bedding material shall have a minimum thickness of four (4) inches or one-sixth (1/6) of the outside pipe diameter below the bottom of the pipe, whichever is greater. After bedding has been placed, the pipe shall be laid true to line and grade using material described as initial backfill (pipe zone), and the material shall extend twelve (12) inches above the top of the pipe.

3. Relative compaction shall be 90 percent. When sand is selected for initial backfill, the Contractor may elect to "jet" provided excess water is collected at the low points and removed by pumping. Refer to Standard Drawing number 401.

4. Initial Backfill Material.

    a. The initial backfill zone extends from the bottom of the trench to one foot above the top of the pipe. There are four alternative materials which may be used for this material:

        i. Clean natural sand in accordance with Caltrans Section 19.3.025B. Backfill around gas and water facilities shall be clean natural sand.

        ii. Class I, Type A and B Permeable Material in accordance with the Caltrans Standard Specifications Section 68-1.025. The specifications contain gradation requirements as well as the requirement that the material's Durability Index be at least 40.

        iii. A graded granular material which has 100 percent of sizes smaller than one (1) inch between 90 and 100 percent smaller than one-half (1/2), 50 to 90 percent smaller than the No. 4 sieve, between 10 and 30 percent smaller than the No. 50 sieve, and less than 15 percent smaller than the No. 200 sieve. The gradation of the material should be determined in accordance with ASTM Test D416-39. The minimum sand equivalent of this alternative material shall be 30.

    b. Controlled Density Fill (CDF) as described below.

        i. CDF shall be a mixture of Portland cement, fly ash, aggregates, water, and admixture proportioned to provide a non-segregating, self-consolidating, free-flowing, and excavatable

        ii. Material that will result in a hardened, dense, non-settling fill.

        iii. CDF shall be composed of Portland cement, aggregate, fly ash, and water and shall conform to the following requirements:

        iv. Portland cement: ASTM C150, Types I or II.

        v. Aggregate: Sand with or without fine gravel, maximum size three-quarters (3/4) inch. Aggregate shall be free of foreign material or organics and shall have less than 10 percent finer than the No. 200 sieve, unless clean coarse aggregates are added to the mix.

        vi. Water (potable).

        vii. Fly Ash: Class F ASTM C618, unless otherwise approved.

c) CDF shall be proportioned to be a flowable, non-segregating, consolidating, low shrink slurry with a slump and unconfined compressive strength of 100 psi (+50 psi, -20 psi) at fourteen (14) and twenty-eight (28) days. Maximum density 130 pcf.

d) The Contractor and its supplier shall determine the materials and proportions used to meet the requirements of these Specifications. The Contractor shall make daily checks of the aggregate gradation and adjust the mix design as required to meet these specifications. The CDF mix shall be modified as necessary to meet the flowability, pumpability, and set time requirements for each individual pour.

e) At least thirty (30) days before placing CDF, the Contractor shall submit to the Engineer a mix design for the CDF to be used. The mix design shall include trial lab and field date, with six (6) inch by twelve (1) inch cylinder breaks performed at fourteen (14) and twenty-eight (28) days.

f) No CDF shall be placed until the Engineer has approved the mix design. The Engineer's approval of the mix design shall be understood to indicate conditional acceptance. Final acceptance will be based on tests conducted on field samples and conformance with these Specifications.

G. Subsequent Backfill

1. Improved Areas: Material described as subsequent backfill shall be compacted to 90 percent minimum relative compaction except the top twenty-four (24) inches, which shall be mechanically compacted to 95 percent minimum relative compaction.

2. Mechanically compacted subsequent backfill shall be placed in horizontal layers not exceeding eight (8) inches. Thicker compaction lifts using alternative equipment, complying with the manufacturer's specification, will require the approval of the Engineer.

3. Use of alternative compaction equipment shall not relieve the Contractor from responsibility for any damage to the pipe, surrounding ground, or existing and new improvements. Compaction of subsequent backfill by jetting (except the top twenty-four (24) inches) may be permitted by the Engineer when the backfill material is sand and the foundation materials will not soften or otherwise be damaged by the applied water. Jetting and "point" vibration shall be as indicated in the Standard Drawing, number 401.

4. Backfill Zone -The subsequent backfill zone shall extend from the top of the initial backfill zone up to the bottom of the pavement section. In unimproved areas, those not within the street areas, the subsequent backfill zone should extend from the top of the initial backfill zone up to the final grade. Unimproved areas may be backfilled with excavated native material or the following materials recommended for the improved areas of the project.

5. Subsequent Backfill Material

    a. Five alternative materials may be used for the subsequent backfill zone in improved areas:

        i. Clean natural sand in accordance with Caltrans Section 19.3.025.B

        ii. Clean quarry fines.

        iii. Class II Aggregate Base in accordance with Caltrans Standard Specifications Section 26-1.02. Either one-and-one-half (1-1/2) inch or three-quarters (3/4) inch maximum Class II Aggregate Base may be used.

        iv. A graded granular material which contains no organics and has 100 percent of sizes smaller than three-quarters (3/4) inch, between 60 and 100 percent smaller than three-quarters (3/4) of an inch, 45 to 90 percent smaller than the No. 4 sieve, between 5 and 30 percent smaller than the No. 100 sieve, and less than 15 percent smaller than the No. 200 sieve. The gradation of the material shall be determined in accordance with ASTM Test D316-39.

        v. Controlled density backfill as described above.

6. Unimproved Areas

    a. Shall be defined as any area where hard-scaped or landscaped improvements do not exist and where trench settlement would not be detrimental to existing or anticipated improvements. In the unimproved areas described above, the Engineer may permit the use of native material as subsequent backfill. The subsequent backfill may be jetted or mechanically compacted to 85 percent minimum relative compaction.

H. Trench Surface Restoration

1. Street Restoration on Open Cut Installation

   a. If installing utility laterals by open trenching methods to 50% of houses per block or more on an Asphalt Concrete (AC) street rated to be “Excellent” or in “Very Good” Condition, then the Contractor shall wedge cut and install a minimum one-and-one-half (1-1/2) inch asphalt overlay covering the entire street as determined by Public Works Engineering Services. When an overlay covering the entire street is required, the street cut fee may be waived as determined by the City Engineer.

   b. If a trench is to be installed parallel to and within two (2) feet of an existing trench or lip of gutter then the Contractor shall remove and replace the existing pavement section between the new trench and the outside edge of the existing trench and/or lip of gutter as determined by Public Works Engineering Services.

   c. If a trench is to be installed parallel partially or fully within a bike lane, then the Contractor shall remove and replace the full width of the affected bike lane section, typically from lip of gutter to bike lane line, there shall be no longitudinal/parallel joints within the bike lane in addition to other requirements as determined by Public Works Engineering Services.

   d. a, b, & c will not apply if the street is scheduled by Public Works Engineering Services to be resurfaced within one (1) year after completion of trenching work.

2. Street Restoration on Bore/Pipe Bursting or similar Installation

   a. If installing utility laterals to 50% of the house per block and/or mains by bore technology on a street that has been slurry or micro surface sealed in the past two (2) years and is rated to be “Excellent” or in “Very Good” condition, then the Contractor shall install slurry seal or microsurfacing utilizing black volcanic rock to match the surrounding pavement conditions to prevent the road from having a checkerboard appearance.

   b. Contractor shall remove USA markings from all surfaces once a project has been completed, using an appropriate method approved by the Engineer.

3. Improved Areas - Pavement shall be replaced either in-kind or in accordance with the following table, whichever is greater.

Existing Pavement Material	Minimum Structural Section
Asphalt Concrete (AC)	2" AC over 8" Aggregate Base or 8" AC Deep Lift
Portland Cement Concrete (PCC)	6" PCC over 6” Aggregate Base
AC over PCC	2” AC over 6” PCC over 6” Aggregate Base

4. Unimproved area – Trench shall be replaced in kind

5. Limits of Trench restoration.

    a. Portland Cement Concrete surfaced streets.

        i. Restore all materials in kind to match existing elevations and grades.

        ii. If a trench is within three (3) feet of Top of Curb of Type B rolled curb or within two (2) feet of the Face of Type A curb, remove and replace curb monolithically.

        iii. If a trench is within two (2) feet of a deep control joint, remove and replace the section between the control joint and the trench monolithically with the trench restoration. This method of restoration does not alleviate the requirement for a T-Cut elsewhere.

        iv. If a trench is to be installed on a PCC slab with minimal cracking and is in excellent condition, the entire PCC slab shall be replaced per Standard Drawings Number 401 and 403.

    b. Asphalt Concrete surfaced streets with no exposed gutter pan.

        i. The asphalt shall be removed (approximate where the lip of gutter shall be) to verify width of existing gutter pan.

        ii. Restore all materials in kind to match existing elevations and grades.

        iii. When “trench limits” are within three (3) feet of the Lip of Gutter for either Type A or Type B curb and gutter on a PCC surface street, extend the “T – Cut” to the Lip of Gutter as shown in Standard drawing number 403.

iv. If trench limit is NOT within two (2) feet at the Lip of Gutter, the "T-Cut" limit shall be located twelve (12) inches from Trench Limit as per Standard drawing number 403.

v. If Trench is within three (3) feet of Top of Curb of Type B rolled curb or within two (2) feet of the Face of Type A curb, remove and replace curb monolithically.

c. Asphalt surfaced street with an exposed gutter pan.

i. Restore all materials in kind to match existing elevations and grades.

ii. When "trench limits" are within three (3) feet of the Lip of Gutter for either Type A or Type B curb and gutter on a PCC surface street, extend the "T – Cut" to the Lip of Gutter as shown in Standard drawing number 403.

iii. If "trench limit is NOT within three (3) feet at the Lip of Gutter, the "T- Cut" limit shall be located twelve (12) inches from Trench Limit as per Standard drawing number 403.

iv. If Trench is within three (3) feet of Top of Curb of Type B rolled curb or within two (2) feet of the Face of Type A curb, remove and replace curb monolithically.

v. If a trench to be installed is perpendicular and through the gutter pan (such as a service lateral), to more than 50% of the houses per block, the existing section of curb and gutter disturbed by the work shall be restored to the nearest cold joint.

I. Testing

a. Testing shall be performed to ensure compliance with these specifications. The test(s) shall be conducted at no cost to the City. Field density tests shall comply with ASTM D2916-71 and D3017-78 (determination of in-place density and water content of soils and soil-aggregate by nuclear methods). Laboratory determination of maximum density shall comply with ASTM D1557-78.

END OF SECTION

SECTION 18

STORMWATER PIPELINES

18-1 GENERAL

A. Reinforced concrete pipe or High Density Polyethylene Pipes used for storm drains shall conform to the provisions of Section 65, Reinforced Concrete Pipe, and Section 64, Plastic Pipe, of the Caltrans Standard Specifications, except as modified herein.

B. Polyvinyl Chloride pipe, ductile iron pipe (DIP), and High Density Polyethylene Pipe shall be used for storm drains where the usage of reinforced pipes or High Density Polyethylene Pipes are constrained and only if approved by the Engineer. Comply with provisions specified herein.

C. Storm drain pipes within the public right-of-way shall be a minimum of twelve (12) inches in diameter unless otherwise approved by the Engineer.

18-2 RELATED WORK

A. Field Quality Control

1. Perform leakage tests and Mandel tests on the project site before backfilling the trench when the City inspector is present. Acceptance of materials shall be subject to strength and quality testing in addition to inspection of the completed product.

18-3 PRODUCTS

A. Reinforced Concrete Pipe (RCP)

1. All reinforced concrete pipe shall be Class III unless otherwise specified on the drawings.

B. Polyvinyl Chloride Pipe (PVC)

1. Pipe sizes are nominal inside diameter unless otherwise noted. PVC pipe and fittings for three (3) to twelve (12) inches in diameter shall meet requirements of AWWA C900, PR 200, DR 14. Three-inch pipes shall only be used for curb-outlets. For pipe and fittings with diameters between fourteen (14) to twenty-seven (27) inches, they shall meet the requirements of AWWA C 905, PR 235, DR 18.

2. Pipe and fittings shall be bell and spigot type PVC manufactured in a one-piece mold with injection PVC compound conforming to ASTM D1784, class 12454 B. Elastomeric-gasketed couplings will be allowed for use at tie-ins or other locations

where standard bell and spigot pipe cannot be used. Bells shall conform to ASTM D3139 as measured in accordance with ASTM D2122 and gaskets shall conform to ASTM F477.

3. Each length of PVC pipe and fittings shall be marked with:

   a. The nominal size and OD base

   b. PVC

   c. Dimension ratio number (for example DR 14)

   d. AWWA pressure class or rating (for example PR 200)

   e. AWWA designation number (for example AWWA C900)

   f. The manufacturer's name or trademark and product record code.

C. Ductile Iron Pipe (DIP)

1. Pipe shall comply with AWWA C151 while the joints are push-on type complying with AWWA C111 with Chloroprene gaskets. Fittings shall be ductile iron or cast iron push-on joints complying with AWWA C110.

2. Special fittings not available in ductile iron or cast iron pipe may be fabricated of welded steel pipe (Type M-2 Pipe) with a design pressure of 450 PSI. Design and wall thickness shall be submitted to the Engineer for review.

3. For the following pipe sizes, use the corresponding thickness class:

Pipe Size (inches)	Thickness Class
3-4	51
6-24	50
30-54	51

4. Pipe and fittings shall consist of standard thickness cement mortar lining for pipe and fittings per AWWA C104

5. For corrosion protection, use polyethylene encasement per AWWA C105. Double wrap flanged fittings, mechanical joints, or other appurtenances with significantly different outside diameters from the pipe.

6. For bonding, use Bond T.N-1.P. to provide electrical continuity. Copper jumper strips shall be one-sixteenth (1/16) inch thick by three-quarters (3/4) inch wide.

D. High Density Polyethylene Pipe and Fittings (HDPE)

1. Manufacturer: Hancor BLUE-SEAL, water tight pipe and fittings, or approved equal.

2. Pipe shall meet AASHTO M294, Type S or ASTM F2306 standards.

3. Virgin material for pipe and fitting production shall be high density polyethylene conforming with the minimum requirements of cell classification 435400C as defined and described in the latest version of ASTM D3350, except that carbon black content shall not exceed 4%. Virgin pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Section 9.5 and 5.1 of AASHTO M294 and ASTM F2306 respectively.

E. Storage and Handling

1. Great care shall be exercised to prevent damage to the pipe during handling, transportation or storage. Pipe shall not be stored on rough ground and rolling of the pipe on the coating will not be permitted. Any damaged pipe sections shall be repaired or replaced at the expense of the Contractor as satisfactory to the Engineer.

2. Store PVC pipe under opaque covers which do not transmit ultraviolet light.

3. Each pipe section shall be carefully inspected before installation, and all damaged areas patched in the field or replaced as satisfactory to the Engineer.

18-4 EXECUTION

A. Trench excavation and backfill shall conform to the provisions in the City of Palo Alto Standard Drawings and Specifications Section 17, “Boring, Trenching and Potholing” and Drawing numbers 401, “Trenches – Typical Cross Sections” and 403, “Trenches – Limits of Restoration.”

B. Lay each length of pipe on a firm bed with a true bearing for its entire length between bell holes. Excavate holes of only sufficient size to accommodate the bell at each joint location. Adjust line and grade by scraping away, filling in and tamping the earth to provide true grade to fit the barrel of the pipe. No wedging or blocking up of the pipe will be permitted. The trench and bell holes shall be kept free from water during the laying of the pipe.

C. All dirt and foreign matter shall be removed from the pipe interior prior to installation and all joints shall be thoroughly cleaned before joining.

D. Plug open ends of pipe when construction is not underway.

E. Lay pipe upgrade with bell end forward, unless specifically shown otherwise.

F. After making each joint, rigidly secure the pipe in place by backfilling to the top of the pipe at the center. Keep fill clear of bell hole so it does not interfere with the next jointing operation.

G. Polyvinyl Chloride Pipe (C900 and C905) Installation

1. Install pipe in accordance with the manufacturer's instructions. Place pipe within the installation areas at least twenty-four (24) hours prior to installation to permit temperature equalization.

2. Pipe ends shall be cut squarely, reamed and deburred inside and out. Clean pipe ends and bells of dirt, grease and other foreign materials prior to making the joint.

H. Ductile Iron Pipe Installation

1. Install buried pipe in accordance with AWWA C600. Support and brace encased pipe to support the pipe and to prevent movement during testing and placement of the concrete encasement. The braces and supports shall be erected of materials and by methods which will prevent any future contact of the pipe with the environment surrounding the encasement.

2. Wrap buried pipe with 8 mil polyethylene film in accordance with AWWA C105. Continuously seal seams and overlaps with tape. Seal circumferential overlaps with two turns of tape, half lapped. Gather excess polyethylene on top of pipe so as not to block backfill material from getting under bottom of pipe. Use caution so as not to rip or cut the polyethylene film. Seal any rips or cuts in the film with tape.

3. Pull the slack out of restrained joints after they are made up.

I. High Density Polyethylene Installation

1. HDPE pipe shall be installed in conformance with all applicable local and state codes and regulations. The methods employed in the handling and placing of pipe, fittings, and equipment shall be such as to ensure that after installation and testing they are in good condition. Should damage occur to the pipe, fittings, or equipment, repairs satisfactory to the City shall be made at no additional cost to the City.

2. Installation shall be in accordance with ASTM D2321 and manufacturer's recommended installation guidelines. Pipe and fittings shall be installed as shown on the plans, according to manufacturer's recommendations.

3. Minimum cover in traffic areas shall be three (3) feet, all exceptions require prior approval from City Engineer. Backfill for minimum cover situations shall consist of Class 1 material.

4. Thoroughly clean pipe and fittings of dirt, dust and moisture before installation. Installation and joining methods shall be as recommended by the pipe and fitting manufacturers.

J. Cleaning

1. After installation and prior to any testing, the inside of the pipe shall be thoroughly cleaned of all dirt, loose scale, sand and other foreign material. Cleaning shall be by flushing with water or balling as appropriate for the size and type of pipe.

2. Video Inspection: After installation, pipe and structures shall be cleaned and video inspected as direct by the Engineer. If video inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to re-clean and re-inspected the lines at no additional cost to the City.

K. Permanent Plugs and Pipe Removal

1. Existing pipes that are no longer in use shall be removed completely.

2. Clean interior contact surfaces of all pipes to be cut off or abandoned. Construct a concrete plug in the end of all pipe eighteen (18) inches or less in diameter.

3. Minimum length of concrete plugs shall be eight (8) inches. For pipe twenty-one (21) inches and larger, the plugs may be constructed of common brick or concrete block.

4. The exposed face of block or brick shall be plastered with mortar. All plugs shall be watertight and capable of withstanding all internal and external pressures without leakage.

END OF SECTION

SECTION 19
REINFORCEMENT

19-1 GENERAL

A. Reinforcement shall conform to the appropriate provisions of Section 52, "Reinforcement", of the Caltrans Standard Specifications.

END OF SECTION

SECTION 20
SLOPE PROTECTION

20-1 GENERAL

A. Slope protection shall conform to the appropriate provisions of Section 72, "Slope Protection", of the Caltrans Standard Specifications.

END OF SECTION

SECTION 21
LIGHTING, ELECTRICAL, AND TRAFFIC SIGNAL SYSTEMS

21-1 GENERAL

A. All lighting, electrical and traffic signal systems shall conform to the City of Palo Alto Electric Utility Standards compiled and distributed by the City Utilities Department, Electrical Engineering Division.

B. All existing City lighting, electrical and traffic signal systems shall be operated only by City staff. All utilities shall be located prior to any excavation by calling Underground Service Alert (USA) at 811 or 800-642-2444 at least five (5) working days before excavation begins, unless otherwise stated by City contract.

END OF SECTION

SECTION 22

WATER, GAS, AND WASTEWATER SYSTEMS

22-1 GENERAL

A. All water, gas, and wastewater systems shall conform to the latest City of Palo Alto Water-Gas-Wastewater Utility Standards compiled and distributed by the City Utilities Department; Water, Gas and Wastewater Engineering Division. All existing City water, gas and wastewater systems shall be operated and maintained by City staff. All utilities shall be located prior to any excavation by calling Underground Service Alert (USA) at 811 or 800-642-2444 at least five (5) Working days before excavation begins, unless otherwise stated by City contract.

END OF SECTION

SECTION 23

RECYCLED WATER

23-1 GENERAL

A. Any use of recycled water must conform to the Palo Alto Regional Water Quality Control Plant Permit and Procedures guidelines ("Guidelines"). These Guidelines govern the use of non-potable recycled water. Recycled water shall not be discharged to the storm drain system. These Guidelines are available from the Palo Alto Regional Water Quality Control Plant (or at the Plant website). The Plant contact number is (650) 329-2598.

B. The Contractor must use recycled water for construction use whenever possible. When recycled water is utilized, the Contractor shall place a sign on the truck stating that "Non-potable recycled water is being used" and the water shall not be used as drinking water.

The Contractor shall apply for a permit to purchase recycled water at the Water Quality Control Plant, 2501 Embarcadero Way in Palo Alto or call (650) 329-2598 for an application. The use of recycled water shall be in accordance to the State Water Resources Control Board requirements.

Potable water shall not be used to clean streets, sidewalks, walkways, driveways, patios, parking lots, fill pavement rollers, fill asphalt concrete grinders and other hard surfaced areas or building structures. The Contractor may NOT use potable water from City hydrants.

C. Contractor shall primarily use street sweepers for dust alleviation and control instead of water, unless directed otherwise by the Engineer. All sweepers must use recycled water or be filled from non-potable sources, such as construction dewatering water.

END OF SECTION

SECTION 24

INERT SOLIDS AND BUILDING MATERIALS RECYCLING

24-1 CONSTRUCTION AND DEMOLITION DEBRIS DIVERSION FROM LANDFILL

A. The diversion of construction and demolition (C&D) debris from landfill is required. C&D debris includes but is not limited to, reusable building materials, inert solids (e.g., concrete, rock, stone, brick, sand, soil, and fines), single-separated debris by type (e.g., wood only, metal only), and mixed C&D debris (e.g., mixture of multiple types of material such as wood, metal, gypsum board, landscape debris).

B. Management of C&D debris from covered projects must conform to the requirements of the California Green Building Standards Code and local amendments (PAMC Chapter 16.14). Deconstruction is encouraged and salvageable materials must be made available for reuse prior to recycling. Reuse of materials on current project site is encouraged. All remaining debris must be diverted to a City-approved facility. The city shall make available a current list of approved facilities.

C. Diversion activities must be documented and submitted to the Engineer on a daily basis and include the following:

1. Project title
2. Date and time
3. Truck number
4. Type of material
5. Weight of material

6. Original receipts and weight tags or other records of measurement from the approved facility, which document the address of the project and documentation of how the material would be processed.
7. Weight tags or count of material salvaged or reused offsite or in current project.

D. Only source separated single recyclable materials can be collected by another collector other than the City's collection Contractor. "Source separated single recyclable materials" are recyclable materials that are separated from other recyclable materials or solid waste and placed in separate containers according to type or category of materials and directly marketed as a single commodity.

END OF SECTION

SECTION 25

STREET TREE WELL

25-1 GENERAL

A. The scope of this work shall include, but not be limited to, frame and grate installation, excavation, drain pipe installation, backfilling with topsoil, and tree stake installation in accordance with this section and Standard Drawing 601 and 601A.

25-2 RELATED WORK

A. Refer to Section 7 for “Clearing and Grubbing”.

B. Refer to Section 16 for “Concrete Curbs, Gutters, Valley Gutters, Sidewalks, Driveways, Curb Ramps and Streets”.

25-3 PRODUCTS

A. Frame and Grate: Kiva model (square or rectangular) as manufactured by Urban Accessories, (877) 487-0488, www.urbanaccessories.com.

B. Drain Pipe: Three (3) inch diameter perforated plastic flexible drain pipe, with filter fabric wrap, and fittings.

C. Topsoil: Submit sample for approval by the Engineer.

D. Tree Stake: Grate Stake as manufactured by J. R. Partners, (888) 333-3090, www.jrpartnersco.com, or approved equal.

25-4 EXECUTION

A. Frame and Grate Installation

1. Install frame and grate in new or existing pavement per manufacturer’s instructions.

B. Excavation

1. Excavate and dispose of all soil, stumps, roots and other debris within the length and width of the tree well, and to a minimum depth of two (2) feet.

2. Scarify or deeply score the sides of the excavation to facilitate root growth into the surrounding soils.

C. Drain Pipe Installation

1. Assemble and position drain pipe. Finish exposed pipe ends with perforated end caps or slotted grates. Temporarily close caps or grates with plastic and/or tape until backfilling and planting is complete. The ends of the drain pipe shall be two (2) inches above soil level.

D. Backfill with Topsoil

1. Backfill excavation in two lifts without disturbing drain pipe. Lightly tamp each lift. Final soil surface shall be four (4) inches below finish grade.

2. Coordinate backfilling with tree planting operation when possible.

3. If tree planting is delayed, a barricade shall be secured to the grate until planting begins.

E. Tree Stake Installation

1. Install two (2) tree stakes per manufacturer's instructions. Position stakes perpendicular to curb when possible.

END OF SECTION

SECTION 26

TREE PROTECTION

26-1 GENERAL

A. Tree protection has three primary functions:

1. To keep the foliage canopy and branching structure clear from contact by equipment, materials and activities;

2. To preserve roots and soil conditions in an intact and non-compacted state and:

3. To identify the Tree Protection Zone (TPZ) in which no soil disturbance is permitted and activities are restricted, unless otherwise approved.

B. The Tree Protection Zone (TPZ) is a restricted area around the base of the tree with a radius of ten-times the diameter of the tree's trunk or ten (10) feet; whichever is greater, enclosed by approved fencing type.

C. All types of tree protection shall first be approved by the Public Works Department – Urban Forestry.

26-2 RELATED WORK

A. Standard Drawing 605 – Illustration of tree protection types described below.

B. City of Palo Alto Tree Technical Manual (TTM)

1. Trenching Restriction Zones (TTM, Section 2.20(C))

2. Arborist Reporting Protocol (TTM, Section 6.30)

3. Site Plan Requirements (TTM, Section 6.35)

4. Tree Disclosure Statement (TTM, Appendix I)

C. Street Tree Verification (STV) of Protection (Form)

26-3 PRODUCTS

A. Six (6) feet high galvanized chain link fence or approved equal.

B. Two (2) inch galvanized posts.

C. Wood, two (2) inches thick

D. Orange plastic fencing.

26-4 EXECUTION

A. Type I Tree Protection

1. The fence shall enclose the entire TPZ of the tree(s) to be protected throughout the life of the construction project.

2. In parking areas, if fencing is located on paving or concrete that will not be demolished, then the posts may be supported by an appropriate grade level concrete base, if approved by Public Works Department – Urban Forestry.

3. All trees to be preserved shall be protected with six (6) foot high chain link fences.

4. Fences are to be mounted on two-inch diameter galvanized steel posts driving into the ground a minimum depth of two (2) feet. Spacing between posts shall not exceed ten (10) feet. Fencing shall extend to the outer branching, unless specifically approved on STV form.

B. Type II Tree Protection

1. For trees situated within a planting strip, only the planting strip and yard side of the TPZ shall be enclosed with the required chain link protective fencing in order to keep the sidewalk and street open for public use.

2. All trees to be preserved shall be protected with six (6) foot high chain link fences.

3. Fences are to be mounted on two (2) inch diameter galvanized steel posts driven into the ground a minimum depth of two (2) feet. Spacing between posts shall not exceed ten (10) feet. Fencing shall extend to the outer branching, unless specifically approved on STV form.

C. Type III Tree Protection

1. To be used only with approval by the Public Works Department. Trees situated in a tree well or sidewalk planter pit, shall be wrapped with two (2) inches of orange plastic fencing from the ground to the first branch and

overlaid with two (2) inch thick wooden slats bound securely (slats shall not be allowed to dig into the bark).

2. During installation of the plastic fencing, caution shall be used to avoid damaging any branches. Major limbs may also require plastic fencing as directed by the City Arborist.

D. 'Warning' sign.

1. A warning sign shall be weather proof and prominently displayed on each fence at twenty (20) foot intervals.

2. The sign shall be a minimum 8.5-inches x 11-inches and clearly state in half (1/2) inch tall letters: "WARNING - Tree Protection Zone - This fence shall not be removed and is subject to a fine according to PAMC Section 8.10.110."

E. Duration.

1. Tree fencing 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 TPZ.

2. Work or soil disturbance in the TPZ requires approval by the City Arborist. Excavations within the public right of way require a Street Work Permit from the Public Works Department.

F. All neighbors' trees that overhang the project site shall be protected from impact of any kind.

G. The applicant shall be responsible for the repair or replacement plus penalty of any publicly owned trees that are damaged during the course of construction, pursuant to Section 8.04.070 of the Palo Alto Municipal Code.

H. The following tree preservation measures apply to all trees to be retained:

1. No storage of material, topsoil, vehicles or equipment shall be permitted within the TPZ.

2. The ground under and around the tree canopy area shall not be altered.

3. Trees to be retained shall be irrigated, aerated and maintained as necessary to ensure survival.

END OF SECTION

SECTION 27

STRIPING, LEGENDS, MARKERS AND SIGNAGE

27-1 GENERAL – Work shall include but be limited to the following: removal and replacement of pavement striping and legends, permanent traffic signs, and removal and disposal of yellow thermoplastic and yellow painted stripe and pavement markings.

27-2 RELATED WORK – Refer to the Caltrans Standard Plans, Specifications and Palo Alto's Traffic Control Requirements, Manual on Uniform Traffic Control Devices (MUTCD) and California's Supplement to the MUTCD.

27-3 PRODUCTS

A. Thermoplastic Material

1. The thermoplastic material and glass beads shall conform to the Caltrans Standard Specifications Section 84-2 except as noted below.

2. The solid resin for the thermoplastic materials shall be "maleic-modified glycerol ester resin" (alkyd binder). This binder shall consist of a mixture of synthetic resins, at least one of which is solid at room temperature, and high boiling point plasticizers. At least one-third of the binder composition shall be solid maleic-modified glycerol ester resin and shall be no less than 8 percent by weight of the entire material formulation. The binder shall not contain petroleum based hydrocarbon resins.

3. Materials for green bicycle lane or shared lane marking (sharrow) shall be thermoplastic, all other materials need prior approval from City Engineer.

B. Pavement Markers

1. Reflective and non-reflective pavement markers shall conform to Section 81-3, "Pavement Markers", of the Caltrans Standard Specifications.

2. Hot melt bituminous adhesive shall be used to cement pavement markers to the pavement.

C. Disabled Person Parking Stall Legends

1. Disabled person parking stall legends shall be thermoplastic or approved equal. Legends shall be a minimum of thirty-six (36) inch square and comply with California Title 24 and ADA standards.

D. Permanent Traffic Signs

1. All traffic signs shall be per the City and Caltrans Standards. The Contractor shall

provide shop drawings and material specifications for the new traffic signs including installation method for approval by the Engineer.

27-4 EXECUTION

A. Removal and Disposal of Yellow Thermoplastic and Yellow Painted Traffic Stripe and Pavement Markings

1. Waste from removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking may contain lead chromate. Provide test results to the Public Works Department to ensure no lead is present. Otherwise, the removed yellow thermoplastic and yellow paint shall be disposed of at a Class 1 disposal facility or a Class 2 disposal facility permitted by the Regional Water Quality Control Board in conformance with the requirements of the disposal facility operator.

2. Prior to removing yellow thermoplastic and yellow traffic striping and pavement marking, personnel who have no prior training, shall complete safety training program provided by the Contractor that meets the requirements of Title 8, California Code of Regulations, Section 1532.1, "Lead," and the Contractor's Lead Compliance Program.

3. Where grinding or other methods approved by the Engineer are used to remove yellow thermoplastic and yellow painted traffic stripe and pavement markings, the removed residue, including dust, shall be contained and collected immediately. Sweeping equipment shall not be used.

4. Collection shall be by a high efficiency particulate air (HEPA) filter equipped vacuum attachment operated concurrently with the removal operations or other equally effective methods approved by the Engineer.

B. Removal of All Other Thermoplastic and Painted Stripe and Pavement Marking

1. All methods of removal shall be reviewed and approved by the Engineer.

2. The stripe and marking grinding shall be vacuumed for dust control. If the Contractor decides to sweep the grinding causing dust, the Engineer shall request that the Contractor use different methods of grinding removal.

C. Pavement Striping, Legends and Marker Installation

1. All existing striping shall be tied-out prior to removal. This tie-out procedure shall consist of triangulation points on adjacent sidewalk, curb or other reference points.

2. Contractor shall replace all existing pavement striping and legends, unless a redesign is ordered by the Engineer.

3. Bike lane striping, six (6) inches wide white stripe, shall conform to the Caltrans Highway Design Manual Figure 1004.3.

    a) Temporary traffic striping and legends shall be placed on the newly patched street prior to the release of the street to the public. These materials shall be either pop-up temporary markers (for arterial streets) or tape (for residential streets). The proposed materials must be submitted to the Engineer for approval prior to use.

4. Permanent striping must be installed seven calendar days after but within ten (10) calendar days of completion of pavement repair or pavement replacement or striping removal, unless directed otherwise by the Engineer.

5. Alignment lines shall be established by the application of cat tracks or dribble lines, the use of laser guidance devices or a combination of both, as detailed in Caltrans Specifications Section 84-1.01 through 1.03.

6. Thermoplastic material shall be applied only to dry pavement surfaces and only when the pavement surface temperature is above 50 degree Fahrenheit.

7. Pavement markers shall be placed in accordance with the Caltrans Standard Specifications, Section 81-3, “Pavement Markers”, and manufacturer's installation procedures.

8. Thermoplastic material and glass beads shall be applied in accordance with the Caltrans Standard Specifications, Section 84-2.02, and manufacturer's installation procedures.

9. If the loop is not visible, the "head signal loop" in left-turn lanes, curb lanes on multi-lane streets, and one-lane side streets, shall have the Caltrans bicycle loop detector legend applied in thermoplastic. See Part III for standard drawings. The Contractor must contact the CPA Traffic Signals Division to have these loops marked and the locations for the legends identified.

10. A twelve (12) inch stop bar and the "STOP" legend shall be in the street at the location of every stop sign (twelve (12) inch stop bar may not be necessary where there is a crosswalk only when directed by the Engineer).

11. All permanent striping shall be thermoplastic material.

12. Thermoplastic material shall be applied in a single uniform layer by extrusion methods as per section 84-2.02 of the Caltrans Standard Specifications.

D. Bike Lanes

1. Bike lanes are to be five (5) feet wide, made up of a two (2) foot wide gutter pan and three (3) feet wide of asphalt paving that is striped and labeled as a bike lane along the edge of the vehicle roadway.

2. Gutter pans transitioning from three (3) feet wide to two (2) feet wide shall have a transition zone of six (6) feet. Reference standard drawing 142 - Curb Transitions

END OF SECTION

SECTION 28
IRRIGATION

28-1 GENERAL

A. The work in this section related to Contractor furnishing and installing an irrigation system.

28-2 RELATED WORK

A. Section 29, PLANTING.

B. City of Palo Alto Water, Gas & Wastewater Utility Standards Details Drawings and Specifications.

28-3 PRODUCTS

A. Pressure Main Line Pipe and Fittings: All Polyvinyl Chloride (PVC) shall bear the manufacturer's trademark name, material designation, size, applicable Iron Pipe Size (I.P.S.) schedule and National Standards Foundation (NSF) seal of approval.

1. PVC Pressure Rated Pipe: ASTM D1785 NSF approved Type I, Grade I, PVC 1120 Schedule 40 with an appropriate standard dimension ratio (S.D.R.), schedule 80 for two-and-one-half (2-1/2) inches or larger.

2. PVC Solvent-weld Fittings: ASTM D2466 Schedule 80, 1-2, II-I NSF approved.

3. Solvent Cement and Primer for PVC solvent-weld pipe and fittings: Type and installation methods prescribed by the manufacturer.

4. Connections between Main Lines and RCVs: Schedule 40 PVC (threaded both ends) nipples and fittings.

B. Lateral Line Piping and Sleeving: All PVC shall bear the manufacturer's trademark name, material designation, size, applicable I.P.S. schedule and NSF seal of approval.

1. PVC Pressure Rated Pipe: ASTM D1785 NSF approved Type I, Grade I, PVC 1120 Schedule 40 with an appropriate standard dimension ratio (S.D.R.).

2. PVC Solvent-weld Fittings: ASTM D2466 Schedule 40, 1-2, II-I NSF approved.

C. Remote Control Valves (Standard Drawing 506): Rain Bird PEB series; PESB or shown on Drawings. *PESB-R used for recycled water applications.

D. Controller (Standard Drawings 501, 502 & 511):

1. Rain Bird ESP series or as shown on the project plans.

E. Control Wires (Standard Drawing 505):

1. Type: Copper with UL approved for direct burial (UF), size 14-1. Common ground wire with white insulating jacket; individual control wires with insulating jacket of color other than white.

2. Splices: Splice-Kote, Dura-Seal heat shrink nylon wire connector, or 'DBY' by 3M.

F. Box for Remote Control Valves: Black rectangular plastic valve box with ID tags inside valve box and lid – Rain Bird VB Series standard size or approved equal. Increase box size as required to fit. Use concrete box with steel lid in areas receiving vehicular traffic or in concrete paving. Install gravel at bottom.

G. Spray Heads (Standard Drawing 509):

1. Pop-up Rain Bird RD-1800-Series, or approved equal, or as listed on the project plans. (example of specification RD-06-P30-F-NP*--- *NP used for Non-potable applications)

2. Shall have approximately 30 psi water pressure coming out of nozzle to prevent "fogging" or misting. Shall have pressure-compensating devices.

3. Shall have ability to prevent low head drainage. Use heads with integral check valves.

4. Shall not have spray blocked by shrubbery, twelve (12) inch pop ups in shrub area.

5. Shrub material to be planted minimum thirty (30) inches clear from pop ups where possible.

H. Quick Coupler Valves (Standard Drawing 507):

1. Quick coupler valve shall be Rain Bird 44LRC (44NP if non-potable water source) or as listed on the Drawings.

I. Backflow Prevention Device (Standard Drawing 512):

1. Wilkins 975XL or approved equal as required by the City of Palo Alto Utilities Standards and as shown on Drawings.

2. Riser assemblies from main line burial depth to backflow preventers shall be copper pipe.

3. All metallic pipe and fittings installed below grade shall be painted with two coats of Koppers #50 Bitumastic, or approved equal. Pipes may be wrapped with an approved asphaltic tape in lieu of the liquid-applied coating.

J. Backflow Prevention Device Enclosure

1. Le Meur or approved equal.

2. Coordinate size of enclosure with plumbing for minimum clearance and size. Enclosure to include hasp and staple to receive padlock. Padlock to be provided by City.

3. Finish: Black powder coat or as listed on the project plans.

K. Ball Valve (Standard Drawing 506): Spears PVC 'True Union' Industrial ball valve Locate before each remote control valve as shown on project plans. Size ball valve to match remote control valve.

L. Gate Valve (Standard Drawing 508): Watts lead free gate valve bronze or as shown on the project plans.

M. Miscellaneous Installation Materials

1. Solvent Cement and Primers for Solvent-weld Joints: Make and type approved by manufacturer(s) of pipe and fittings. Maintain cement proper consistency throughout use.

2. Pipe and Joint Compound: Permatex: Do not use on sprinkler inlet port.

3. All metal fittings shall be lead free.

N. Miscellaneous Equipment/Accessories

1. Concrete Pads: Poured-in-place six (6) sacks mix concrete. See City Standard Specifications Section 16.

2. Thrust Blocks at each 90 degree turn in main line: Poured-in-place six (6) sacks mix concrete.

3. Six (6) sacks concrete mix shall contain six (6) sacks of Type II modified cement per cubic yard and shall provide a minimum of 3500 pounds per square inch at twenty-eight (28) days.

28-4 EXECUTION

A. Examination

1. Water Meter/Water Pressure: Test and verify that existing water pressure is the minimum pressure at maximum system g.p.m. to operate the irrigation system as indicated on the project plans. Contractor to report pressure below 70 psi to City Staff, Project Manager, or City Landscape Architect.

2. Stub-outs: Verify that all stub-outs to be provided under another contract are correctly sized, located and installed as noted on project plans.

3. Notification: Submit written notification within ten (10) working days of above inspections describing all acceptable and non-acceptable site conditions.

B. Connections to Services

1. Provide connection to water source and to the existing meters.

C. Layout

1. Mark shrub location on site using stakes, gypsum, or similar approved means and obtain location approval by the Engineer before spray head locations are set.

D. Excavating and Trenching (refer to Standard Drawings 503 & 504):

1. Dig trenches wide enough to allow a minimum of three (3) inches between parallel pipe lines. Do not bundle pipe together in trenches. Provide a minimum cover from finish grade as follows:

a. Twenty-four (24) inches Deep: Over pipe on pressure side of irrigation control valve, control wirers and quick-coupling valves, and all pipe/sleeves under roadways.

b. Eighteen (18) inches Deep: Over pipe on non-pressure side of irrigation control valve.

E. Pipeline Assembly

1. General

    a. Install pipe and fittings in accordance with manufacturer's current printed specifications.

    b. Clean all pipes and fittings of dirt, scale and moisture before assembly.

2. Solvent-welded Joints for PVC Pipes:

    a. Solvents: Use solvents and methods specified by pipe manufacturer.

    b. Curing Period: Minimum of one (1) hour before applying any external stress on the piping and at least twenty-four (24) hours before placing the joint under water pressure.

3. Threaded Joints for Plastic Pipes:

    a. Quick Coupler Valve Swing Joint Assembly: Use non-hardening pipe joint compound.

    b. Use Permatex on all other threaded PVC fittings.

    c. Joining: Use strap type friction wrench only. Do not use metal-jawed wrench. Assemble finger tight plus one or two turns.

4. Laying of Pipe:

    a. Bedding On-grade: Remove from trench all rocks or clods. Bed pipe in at least two (2) inches of soil excavated from trench. Backfill on all sides of piping to provide a uniform bearing.

    b. Snaking: Snake pipe from side to side of trench bottom to allow for expansion and contraction. Minimum allowance for snaking is one (1) additional foot per one-hundred (100) feet of pipe.

    c. Moisture Restrictions: Do not lay PVC pipe when there is water in the trench. Do not assemble PVC pipe unless the pipe is dry.

F. Control Valves (refer to Standard Drawing 506):

1. Install in valve box where shown on drawings and group together where practical. Install box flush with finish grade, not necessarily level.

2. Install ID tags on all valves.

3. For connections/expansions to existing systems, coordinate with Parks Managers for capacity and continuation of valve ID tags.

4. Install only one valve per box unless instructed otherwise by a city representative.

5. Each remote-control valve needs to be supported during installation and backfilling to ensure the main line, valve, and lateral are straight, level and not buried at different angles putting stress on pipe and fittings.

G. Sprinkler Head Installation (refer to Standard Drawings 509, 510, 513 and 513a):

1. Pop-up Heads:

a. Place all sprinkler heads in planting areas with top of heads set to finish grade or top of mulch as required.

b. Place part-circle pop-up sprinkler heads six (6) inches from edge of and flush with top of adjacent paved areas at time of installation.

c. See standard Drawings 513 (Bubbler on Flex Tube) and 513a (Drip Loop System) for more details.

2. Refer to AB 1881 Guidelines for overhead irrigation near hardscapes for distances at top right of drawing. Overhead irrigation shall not be permitted within twenty-four (24) inches of any non-permeable surface. Allowable irrigation within the setback from non-permeable surfaces may include drip, drip line, or other low flow non-spray technology. The setback area may be planted or unplanted. The surfacing of the setback may be mulch, gravel, or other porous material.

H. Automatic Controller (refer to Standard Drawings 501 & 502):

1. General: Install per local code and manufacturer's current printed specifications.

2. Connection to Valves: Connect remote control valves to controller.

a. For two-wire decoder systems, coordinate decoder connection with Parks Managers and have addresses for each valve on a spreadsheet corresponding with valve number on plan.

I. Control Wiring (refer to Standard Drawing 505):

1. General: Install control wires in common trenches with sprinkler mains and laterals wherever possible. Lay to the bottom side of pipe line. Provide looped slack at valves. Snake wires in trench to allow for contraction of wires. Tie wires in bundles at ten (10) feet intervals.

2. Extra Length: Provide thirty (30) inches extra control wire at remote control valve splice to facilitate the removal of the remote control bonnet to finish grade without cutting wires.

3. Spare: Install one unconnected spare control wire running from the controller to control valve box.

4. Splicing: Crimp control wire splices at remote control valves. Seal with specified splicing materials.

J. Closing of Pipe and Flushing of Lines:

1. Capping: Cap or plug all openings as soon as lines have been installed to prevent entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.

K. Testing of Irrigation System:

1. Make hydrostatic tests with RCV and QC installed and when welded PVC joints have cured at least twenty-four (24) hours. Center load piping with backfill to prevent pipe from moving under pressure. Keep all couplings and fittings exposed. Contact City Landscape Architect and Parks Manager seventy-two (72) hours in advance to set up pressure test and site review.

2. Pressure test valves and quick couplers for a minimum of six (6) hours at 10 psi higher than rated.

3. Pump system up to a minimum of 125 psi the day preceding the scheduled test and verify that pressure is holding. Inspect system early the following day.

4. Apply continuous static water pressure of 125 psi in accordance with Caltrans Standard Specifications Section 20-2.01A(4)(b)(ii) Method A.

    a. For Method A pressure testing for leakage:
        i. Calibrate pressure gauge from 0 to 200 psi in 5 psi increments. Pressure gauge must be accurate to within a tolerance of 2 psi.

ii. Fill the supply line with water and connect the line to a pressure gauge. Place the pipeline under a pressure of 125 psi. Remove the source of pressure and leave the line under the required pressure.

iii. Test the supply line under the required pressure for a period of one (1) hour. The pressure gauge must remain in place until each test period is complete.

iv. Leaks that develop in the tested portion of the system must be located and repaired after each test period if a drop of more than 5 psi is indicated by the pressure gauge. After the leaks have been repaired, repeat the one (1) hour pressure test until the drop in pressure is 5 psi or less.

b. For a system consisting of a new supply line connected to an existing line, the new supply line must be isolated from the existing line and tested.

5. Once the leaks in the system have been repaired, contact City representatives (City Project Manager, Landscape Architect and Parks Managers) for static pressure test of 125 psi for a four (4) hour duration. Once system holds for four (4) hours without a drop in pressure, it will pass.

6. Contractor is to have backflow device tested and completed certification submitted to City Landscape Architect, Parks Managers, and Project Manager.

L. Adjustment of the System:

1. Flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways and buildings. Adjust the arc and radius as applicable. Adjustment to arc and radius to be max of 25% of intended design, greater adjustment requires review of overall irrigation design.

2. Set all sprinkler heads perpendicular to finished grades unless otherwise noted on the project plans.

3. When the landscape sprinkler system is completed and before planting, perform a coverage test to determine if the water coverage for planting areas is adequate. Contact City Landscape Architect seventy-two (72) hours in advance to set up coverage meeting.

4. Test controllers individually. Demonstrate that all control valves operate electronically. Provide vehicles and radio equipment as necessary to expedite this process. Installation contractor to meet with City Staff & maintenance contractor to review operation of each devise upon completion/turnover of project.

5. Demonstrate that irrigation scheduling programmed into controller is adequate for plant requirements without causing runoff, and that scheduling capacities of controller are utilized.

M. Backfill and Compacting

1. General: After system is operating and required tests and reviews have been made, backfill excavations and trenches with clean soil, free of debris.

2. Backfill for All Trenches: Regardless of the type of pipe covered, compact to minimum 95% density under pavements and 85% under planted areas.

3. Finishing: Dress off areas to finish grades. Re-dress any areas which subsequently settle. Re-seed in the turf area.

N. Maintenance

1. The entire sprinkler irrigation system shall be under full automatic operation for a period of two (2) days prior to any planting.

2. Maintain/repair system for full duration of plant maintenance period.

O. Reviews Prior To Acceptance

1. No reviews will commence without record drawings, without completing previously noted corrections, or without preparing the system for review.

P. Final Review and Cleanup

1. Operate each system in its entirety at time of final review. Any items deemed not acceptable shall be reworked until deemed acceptable.

2. Warranty period will start after the end of the ninety (90) day plant establishment maintenance period and the issuance of substantial completion.

END OF SECTION

SECTION 29

PLANTING

29-1 GENERAL

A. The work in this section is related to planting work and planting maintenance as shown on the drawings and as specified.

B. Manufacturer's recommendations.

1. "Sunset Western Garden Book", Lane Publishing Co., Menlo Park, California; current edition.

2. "American Standards for Nursery Stock", American Association of Nurseryman, 230 Southern Building, Washington, D.C. 20005.

C. Plant Material Standards

1. Quality and Size of Plants: Conform to the State of California Grading Code of Nursery Stock, No. 1 grade. Use only nursery-grown stock, which is free from insect pests and diseases.

2. Comply with federal and state laws requiring inspection for plant diseases and infestations. Submit inspection certificates required by law with each shipment of plants, and deliver certificates to the City. Obtain clearance from the County Agricultural Commissioner as required by law, before planting plants delivered from outside the County in which planted.

3. Palo Alto Tree Technical Manual (TTM), Section 3.30

4. Minimizing the use of turf and use native or climate appropriate plants whenever possible, unless specified otherwise by project specifications.

29-2 RELATED WORK

1. Section 9, EARTHWORK
2. Section 10, SUBGRADE
3. Section 28, IRRIGATION

29-3 PRODUCTS

A. Plants

1. Plant the variety, quantity and size indicated. The total quantity tabulated on the drawings are considered approximate and furnished for convenience only.

2. Tag plants of the type or name indicated and in accordance with the standard practice recommended by the American Association of Nurserymen.

3. Install healthy, shapely and well rooted plants with no evidence of having been rootbound, restricted or deformed.

4. Take precautions to ensure that the plants will arrive at the site in proper condition for successful growth. Protect plants in transit from windburn and sunburn. Protect and maintain plants on site by proper storage and watering.

5. Substitutions will not be permitted, except as follows:

    a. If proof is submitted that any plant specified is not obtainable, a proposal will be considered for use of nearest equivalent size or variety with an equitable adjustment of contract price.

6. Trees: Select straight trunks with the leader intact, undamaged and uncut with all old abrasions and cuts completely callused over. Do not prune plants prior to delivery.

7. Measure trees and shrubs with branches in normal position. Height and spread dimensions indicated refer to the main body of the plant, and not from branch tip to tip.

B. Grasses

1. Turf Seed and Sod Mix: At least 98% pure, weed-free mixture and a minimum of 85% germination, re-cleaned, Grade A "New Crop" seed, delivered in the original containers, unopened and bearing a guaranteed analysis and dealer's label. Mixture as follows:

    a) <u>Palo Alto Mix</u>
    b) 20% Kentucky Bluegrass
    c) 80% Perennial Rye Grass

2. Sod: Machine cut sod to a uniform thickness of three-quarters (3/4) inch excluding top growth and thatch. Each individual sod piece shall be strong enough to support its own weight when lifted by the ends, in vigorous condition, dark green in color, free of disease, weeds and harmful insects. Broken pads, irregularly shaped pieces, and torn and uneven ends will be rejected.

C. Fertilizers

1. Commercial fertilizer, pelleted or granular form, conform to the requirements of Chapter 7, Article 2, of the Agricultural Code of the State of California for fertilizing materials as follows:

   a. Type A: 6% Nitrogen, 20% Phosphorus Acid and 20% Potash, (6-20-20).

   b. Type B: 21 gram planting tablets 20% Nitrogen, 10% Phosphoric Acid and 5% Potash (20-10-5) available from Agriform.

   c. Type C: Complete fertilizer 21% Nitrogen, 7% Phosphoric Acid and 14% Potash (21-7-14).

2. If commercial fertilizer having this analysis is not obtainable, other similar commercial fertilizer may be used providing it meets the approval of the City Landscape Architect and/or Project Manager.

3. Maintenance Fertilizer: Type C

4. Sod Fertilizer: Provided by grower.

D. Soil Amendment: Contractor shall provide soil report.

1. Shredded redwood sawdust or shredded fir and/or pine bark with the following properties:

Percent Passing	Sieve Designation	
100	9.51 mm	3/8"
95-100	6.35 mm	1/4"
80-100 4.76 mm	No. 4	4 mesh
60-100 2.38 mm	No. 8	8 mesh
20-70 1.00 mm	No. 18	16 mesh
0-30 500 micron	No. 35	32 mesh

2. Redwood Sawdust

   a. Dry bulk density, lbs. per cu. yd., 270-370
   b. Nitrogen stabilized - dry weight basis, min. 0.4%

3. Fir Bark

   a. Dry bulk density, lbs. per cu. yd., 450-580
   b. Nitrogen stabilized - dry weight basis, min. 0.5%

4. Salinity (ECe): 4.0 maximum

5. Organic Content: 90% minimum

6. Reaction (pH): 4.0 minimum

7. Submit sample with Laboratory organic amendment analysis report to include above information and iron content.

E. Iron Sulfate: Dry form.

F. Mulch and Ground Cover

1. Organic Mulch: Shall be ground, screened fir bark, one-quarter (1/4) inch to one-half (1/2) inch in size, top dressed on the soil surface of all non-turf planting areas to the depth shown on the plans.

2. Rock Mulch: Hard, durable smooth river bank stone, three-quarters (3/4) inch to one (1) inch diameter in brown color range, Lin Creek or equal.

3. Taffy Rock-crushed gravel. Size range one-quarter (1/4) inch to one-half (1/2) inch.

4. Organic wood chips (supplied by City).

G. Tree Support Poles: Peeled lodge pole pine logs, clean, smooth, new, and sized as follows:

1. Two (2) inch diameter by eight (8) feet long for trees less than eight (8) feet high and one (1) inch caliper.

2. Three (3) inch diameter by eight (8) to ten (10) feet long for trees greater than eight (8) feet high and one (1) inch caliper.

H. Ties: Rubber strap, twenty-four (24) inch minimum length without sharp edges adjacent to trunk, V.I.T. cinch-tie, Dublin, CA, (818)882-9530, or approved equal.

I. Planting Soil (Topsoil):

Planting soil shall be existing surface soil and imported soil as follows:

1. Planting soil shall be imported, fertile, friable, natural, productive soil containing a normal amount of humus, and shall be capable of sustaining healthy plant life.

Planting soil shall be free of subsoil, heavy or stiff clay, rocks, gravel, brush, roots, weeds, noxious seeds, sticks, trash and other deleterious substances. Soil shall not be infested with nematodes or with other noxious animal life or toxic substances. Soil shall be obtained from well-drained, arable land, and shall be of an even texture. Soil shall not be taken from areas on which are growing any noxious weeds such as Morning Glory, Sorrel or Bermuda Grass.

2. Imported planting soil shall have a pH value of between 6.0 and 7.5, a boron concentration of the saturation extract of less than 1 ppm, salinity of the saturation extract at 25 degree C of less that 4.0 millimoles, and a sodium absorption rate (SAR) of less than 8.

3. The silt and clay content of imported planting soil shall not exceed that of the existing soil it is to be placed over. It shall be a "Sandy Loam" as classified in accordance with USDA Standards.

4. Soil Amendment shall be as Specification Section 29-3D.

J. Pre-Emergence Weed Killer: Clean non-staining as recommended by a licensed pest control specialist.

1. Pest control shall be done only by qualified, trained personnel under the supervision of a State licensed pest control operator, using materials approved by the City's Project Manager. The pesticide application shall be done with extreme care to avoid any hazard to any person, pet, or wildlife in the area or adjacent areas, or any property damage. Application shall be in strict accordance with all governing regulations. **Pesticides shall not be used within one hundred (100) feet of any creek or playground area without prior written approval from the City Engineer.**

2. Refer to the City's Integrated Pest Management (IPM) and Sustainable Landscaping policies for additional requirements.

K. Vine Ties: Train vine branches to Pergola supports with vinyl ties with anchor screws.

29-4 EXECUTION

A. Fine Grading and Soil Preparation.

1. Inspect planting areas and remove all rocks, sod and other foreign material. Except where tree roots are evident, scarify all planting areas in two directions full depth of compaction (to a minimum of twelve (12) inches) into undisturbed native soil prior to backfilling. Scarification of any planting area which cannot be

accomplished with a tractor shall be accomplished by an alternative method approved by the City's Landscape Architect and/or Project Manager to the specified depth to ensure proper drainage.

2. Uniformly distribute and spread planting soil backfill in planting areas in layers not to exceed twenty-four (24) inches and compact to a maximum of 85% relative compaction.

3. When the planting soil differs in clay and silt content from the subsoil it is to be placed upon, install a three (3) inch thick lift of planting soil on the subgrade and rototill into the subgrade twelve (12) inches deep before installing the remaining required planting soil.

4. Do not work planting soil in a wet or muddy condition or dump or spread in areas where subgrade is not in proper condition.

5. Water settling, puddling, and jetting of fill and backfill materials as a compaction method is not acceptable.

6. Maintain moisture content of materials during compaction operations within required moisture range to obtain indicated compaction density.

7. Before proceeding with the work: Carefully inspect all areas and verify all dimensions and quantities. Immediately inform the Landscape Architect of any discrepancy between the drawings and specifications and actual conditions and secure approval to proceed.

8. Planting operations shall be performed only during periods when beneficial results can be obtained. When excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped until conditions are satisfactory.

9. Thoroughly wet down the planting areas to settle the soil and confirm irrigation coverage and operation. Allow soil to dry so as to be workable.

10. Planting area soil shall be in a loose, friable condition prior to planting.

11. Drag to a smooth, even surface. Grade to form all swales, pitch to catch basins, streets, curb, etc., to ensure uniform surface drainage. Areas requiring grading include adjacent transition areas which shall be uniformly level or sloped between finish elevations.

12. Hold finish grade and/or mulch surface in planting areas one-half (1/2) inch below adjacent pavement surfaces, tops of curbs, manholes, etc. The subgrade of the mulch in mulched planting areas shall be a minus two (2) inches for a

distance of twelve (12) to eighteen (18) inches from the edge of pavement. The remainder of the planting area shall be graded to receive the required three (3) inches layer of mulch.

13. Spread soil amendment, iron and Type A fertilizer evenly over installed and rough graded topsoil in all planting areas including turf, ground cover and shrub areas at the following rates:

    a. Soil Amendment: six (6) cubic yards per one thousand (1,000) square feet
    b. Fertilizer: Type A (6-20-20) at twenty (20) lbs. per one thousand (1,000) square feet.
    c. Iron Sulfate: ten (10) lbs. per one thousand (1,000) square feet

14. In areas to receive planting soil in depths of twelve (12) inches or more, rototill above additives into soil six (6) to eight (8) inches deep. In areas to receive planting soil in depths less than twelve (12) inches, premix the additives into the backfill before placement. Keep iron sulfate off pavement and other surfaces to prevent rust staining. Correct all rust damage to work.

15. After the roto-tilling work, float areas to a smooth, uniform grade as indicated on the drawings. Slope all planting areas to drain. Roll, scarify, rake and level as necessary to obtain true, even planting surfaces. Remove rocks, sticks and debris.

16. Particles two (2) inches or larger in size in turf areas and four (4) inches or larger in shrub and ground cover areas. Secure approval of the grade by the Landscape Architect before any planting.

17. Scarify all planting areas that become compacted prior to planting.

B. Seeded Turf Planting

1. Roll surface and grade to level humps, low spots and hollows.

2. Both seed varieties shall be applied uniformly, either by mixing or separate applications of two hundred fifty (250) lbs per acre in total. Use an approved seeding method (slit seeding and broadcast seeding), sowing one-half of the amount in one direction and the remaining one-half in a direction ninety (90) degrees to the first during a windless period. Topdress using a mechanical pull-behind topdresser to cover the entire turf area with one-quarter (1/4) inch of organic compost. Hydroseeding is NOT an acceptable turf seeding method. Field areas shall be fertilized using “starter” type fertilizer (15-15-15) to enhance germination and initial seed vigor after turf areas have been topdressed.

Fertilizer is to be evenly distributed at ten (10) lbs per one thousand (1000) square feet.

3. Wet seeded areas slowly but thoroughly and keep moist, but not saturated, at all times until the grass has germinated.

4. Refer to additional requirements from the City's Parks Maintenance Division.

C. Sodded Turf

1. Lightly roll surface and re-shape to level humps and hollows. Do not sod on dry soil.

2. Lay first strip of sod along a straight line (use a string in irregular areas). Butt joints tightly, do not overlap edges. On second strip, stagger joints. Use a sharp knife to cut sod to fit curves, edges and sprinkler heads.

3. When a conveniently large area has been sodded, water lightly to prevent drying. Continue to sod and to water until installation is complete.

4. After laying all sod, roll lightly to eliminate irregularities and to form good contact between sod and soil. Avoid a heavy roller and excessive initial watering.

5. Thoroughly water the completed sod surface to at least eight (8) inches deep. Repeat sprinkling at regular intervals to keep sod moist at all times until rooted. After sod is established, decrease frequency and increase amount of water per application.

6. Protect turf areas by erecting fences, barriers and signs necessary to prevent trespass. Keep barriers neat and well maintained.

D. Tree and Shrub Planting

1. Mark tree and shrub locations on site using stakes, gypsum or similar approved means and secure location approval by the Landscape Architect before plant holes are dug. Adjust location as necessary prior to planting.

2. Test drainage of plant beds and pits by filling with water (minimum six (6) inches). The retention of water in planting beds and plant pits for more than three (3) hours shall be brought to the attention of the Landscape Architect. If rock, underground construction work, tree roots, poor drainage, or other obstructions are encountered in the excavation of plant pits, alternate locations may be selected by the Landscape Architect.

3. Excavate tree, shrub and vine pits as follows:

Excavation for	Width	Depth
Boxed Trees	Box + 24"	Box + 6"
15 gc plants	Can + 18"	Can + 6"
Canned Shrubs/Vines (1 or 5 gc)	Can + 12"	Can + 6"

4. Break and loosen the sides and bottom of the pit to ensure root penetration and water test hole for drainage as required above.

5. Backfill plant holes with mix as specified, free from rocks, clods or lumpy material. Backfill native soil free of soil amendments under rootball and foot tamp to prevent settlement. Backfill remainder of the hole with soil mix and place plant tablets (Type B fertilizer) three (3) inches below surface of rootball and one-half (1/2) inch from roots at the following rates:

1 gallon can plant	-	1 tablet
5 gallon can plant	-	3 tablets
15 gallon can plant	-	6 tablets
24-inch box plant	-	6 tablets

6. Carefully remove and set plants without damaging the rootball. Superficially cut edge roots vertically on three sides. Remove bottom of plant boxes before planting. Remove sides of boxes after positioning the plant and partially backfilling.

7. Set plants in backfill with top of the rootball two (2) inches above finished grade. Backfill remainder of hole and soak thoroughly by jetting with a hose and pipe section. Water backfill until saturated the full depth of the hole.

8. Build six (6) inch high watering basin berms around trees and shrubs to drain through rootball. Basins are not required around trees in turf areas.

9. Stake and/or guy trees as detailed. Drive stake until solid and remove excess stake protruding above top tree tie to prevent rubbing against branches.

10. Remove any soil from top of plant rootballs.

11. After approval of rootball height, mulch watering basins with organic mulch to two (2) inch depth and thoroughly water. No mulch is required around trees in turf areas.

E. Ground Cover Planting: Plant in neat, straight, parallel and staggered rows as indicated on plan. Plant first row one-half required ground cover spacing behind adjacent curbs, structures, or other plant bed limits. Plant ground cover to edge of water basins of adjacent trees and shrubs. Plant thirty (30) inches from back of curb.

F. Mulch: Mulch all shrub and ground cover areas with organic mulch to a three (3) inch depth. Hold bark mulch away from base (trunk) of plant two (2) to four (4) inches or as directed by the Landscape Architect.

G. Pre-Emergence Weed Killer: Apply pre-emergence weed killer in all areas to receive ground cover planting. Work shall be done under the supervision of a person licensed by the State of California as a pest control applicator and holding a qualified applicator license or a Qualified Applicator Certificate. Obtain approval of the finish grades prior to applying weed killer and coordinate planting and watering with the pest control specialist prior to planting. Take care to keep weed killer off areas to be seeded.

H. Watering: Water all trees, shrubs and ground cover immediately after planting. Apply water to all plants as often and in sufficient amount as conditions may require to keep the plants in a healthy vigorous growing condition until completion of the Contract. Do supplemental hand watering of trees and shrubs during the first three (3) weeks of plant establishment.

When irrigation bubblers are used for watering trees or large shrubs, the bubblers shall be installed on flexible risers and placed on top of the rootball midway between the trunk and edge of the rootball. A minimum of two (2) bubblers shall be installed on fifteen (15) gallon or twenty-four (24) inch box trees, and shall be placed on opposite sides of the trunk.

I. Maintenance of Planting: Maintain plants from time of delivery to site until final acceptance of landscape installation.

J. Pre-Maintenance Period Review and Approval of Planting

1. Receive approval of the installed planting prior to commencement of planting establishment maintenance period. Notify the Landscape Architect a minimum of seven (7) days prior to requested review. Before the review, complete the following:

2. Complete all construction work.

3. Present all planted areas neat and clean with all weeds removed and all plants installed and appearing healthy.

4. Plumb all tree stakes.

5. Seed all turf areas.

6. No partial approvals will be given.

K. Planting Establishment Maintenance

1. General Requirements:

   a. The planting establishment maintenance period required shall be ninety (90) calendar days after all planting is complete, turf is seeded, and installation approved. A longer period may be required if the turf is not thick, vigorous and even, or if the plant material is not acceptably maintained during the maintenance period. The maintenance period may be suspended at any time upon written notice to the Contractor that the landscaping is not being acceptably maintained, and the day count suspended until the landscape is brought up to acceptable standards as determined by the City's Landscape Architect and/or Project Manager.

   b. Planting establishment maintenance immediately follows, coincides with, and is continuous with the planting operations, and continues through turf installation, and after all planting is complete and accepted; or longer where necessary to establish acceptable stands of thriving plants.

   c. Protect all areas against damage, including erosion and trespass, and provide proper safeguards. Maintain and keep all temporary barriers erected to prevent trespass.

   d. Keep all walks and paved areas clean. Keep the site clear of debris resulting from landscape work or maintenance.

   e. Repair all damaged planted areas, and replace plants and reseed or re-sod turf immediately upon discovery of damage or loss.

   f. Check sprinkler systems at each watering; adjust coverage and clean heads immediately. Adjust timing of sprinkler controller to prevent flooding.

   g. Maintain adequate moisture depth in soil to ensure vigorous growth. Check rootball of trees and shrubs independent of surrounding soils and hand water as required.

h. Keep Contract areas free from weeds by cultivating, hoeing or hand pulling. Use of chemical weed killers will not relieve the Contractor of the responsibility of keeping areas free of weeds over one (1) inch high at all times.

2. Tree, Shrub and Ground Cover Maintenance:

   a. Maintain during the entire establishment period by regular watering, cultivating, weeding, repair of stakes and ties, and spraying for insect pests. Prune when requested by the Landscape Architect.

   b. Keep watering basins in good condition and weed-free at all times.

   c. Replace all damaged, unhealthy or dead trees, shrubs, vines and ground covers with new stock immediately; size as indicated on the drawings.

3. Turf:

   a. Maintain during the entire establishment period. Cut as frequently as growth of grass requires. Cut to a height of two (2) inches, unless otherwise directed by the Landscape Architect.

   b. Maintain constant moisture to a depth of eight (8) inches.

   c. Trim edges of turf at paving and headerboards at time of second cutting, and at each later cutting.

   d. Keep a two (2) foot diameter area at tree trunk free of turf at all times to serve as a mowing band. Do not create low area around base of tree.

   e. Keep turf areas free of undesirable weeds and grasses by the application of suitable selective weed killers or hand pulling.

   f. Reseed all damaged areas as soon as evident.

   g. Repair any hollow, settled or eroded areas by filling, rolling and re-sod.

4. Fertilizing:

   a. Upon approval and after submitting fertilizer delivery tags, fertilize all turf and ground cover areas by broad-casting Type C (21-7-14) fertilizer at the rate of 5 lbs. per 1,000 square feet evenly throughout, and reapply every forty-five (45) days until acceptable.

b. Apply ammonium sulfate fertilizer as necessary to maintain vigorous, green grass between fertilizings mentioned above.

c. Observe plant's color, and if a soil pH imbalance is suspected, take soil samples and obtain laboratory analysis for confirmation. Take necessary action recommended in laboratory analysis such as top dressing with soil sulfur, leaching soil, etc.

L. Final Planting Review and Acceptance

1. At the conclusion of the planting establishment period, schedule a final review with the Landscape Architect. On such date, all project improvements and all corrective work shall have been completed. If all project improvements and corrective work are not completed, continue the planting establishment until all work has been completed.

2. Submit written notice requesting review at least ten (10) days before the anticipated review.

3. Prior to review, weed and rake all planted areas, repair plant basins, mow and edge turf, plumb tree stakes, clear the site of all debris and present in a neat, orderly manner.

END OF SECTION

SECTION 30

ENGINEERED SOIL MIX

30-1 GENERAL

A. The work in this section is related to install, furnish, prepare, and compact Engineered Soil Mix (ESM) on a prepared subgrade for the purpose of compaction capacity of 95% and provide ample space in which tree roots will successfully grow.

30-2 RELATED WORK

1. Section 9, EARTHWORK
2. Section 10, SUBGRADE
3. Section 25, STREET TREE WELL
4. Section 26, TREE PROTECTION
5. Section 28, IRRIGATION

30-3 PRODUCTS

A. Engineered Soil Mix

1. Suppliers for the Engineered Soil Mix: All Engineered Soil mixing shall be performed by an agreed upon supplier using appropriate soil measuring, mixing and shredding equipment of sufficient capacity and capability to assure proper quality control and consistent mix ratios. No mixing of engineered soil mix at the project site shall be permitted. Mix suppliers include: TMT Enterprises, 1996 Old Oakland Road, San Jose, California, (408) 432-9040, or approved equal licensed by Amereq Inc. to distribute Engineered Soil according to the Cornell University patent.

2. Mix supplier shall have available at the mixing site sufficient equipment, instrumentation including qualified technicians to determine the weights and water content of the mix components immediately prior to the mixing procedure. The Contractor shall monitor these critical elements throughout the mixing process to provide adequate quality control. The supplier shall maintain a quality control log of material weight, water content and mix proportions for every fifteen (15) tons of material mixed. Maintain adequate moisture content during the mixing process. Soil and mix components shall easily shred and break down without clumping. Soil clods shall easily break down into fine crumbly texture. Soil shall not be overly wet or dry. The supplier shall measure and monitor the amount of soil moisture at the mixing site periodically during the mixing process.

3. The components for the ESM shall conform to the following specifications:

   a. Crushed granite stone: Three-quarters (3/4) inch to one-and-one-half (1-1/2) inch crushed granite quarry rock of angular, sharp texture. AASHTO #4. Stone shall be clean, sharp a free of other stone other than granite. Stone shall be angular in shape with a maximum average length, width and depth ration of 2:1:1. Stones with visible fracture lines will be rejected. Stones shall have a PH between 6.0 and 7.0, and soluble slat levels less than 300 ppm.

   b. Clay loam soil shall conform to the following requirements:

      Gradation Limits

      - Coarse sand: 10 to 15 percent
      - Medium sand: 15-20 percent
      - Fine sand: 0 to 5 percent
      - Clay 27 to 35 percent
      - Silt: 25 to 35 percent

      Chemistry Limits

      - pH between 5.5 and 7.0, and soluble salt levels less than 300 ppm.

   c. Hydrogel: Cross linked potassium copolymer hydrogel as manufactured by Gelscape by Amerq., Congers NY 10920 or Broadleaf P4 1041 W. 18th Street #A103 Costa Mesa, CA 92627, 1-800-628-7374.

   d. Filter fabric: Non-woven continuous filament polyester fabric. Weight 4.0 oz per square yard minimum. Grab strength 100 lbs. water flow rate 105 gpm/sq ft. Delivered in fifteen (15) foot wide roles minimum. Geolon 40 N as manufactured by Nicolon Corp, Valpariso, FL or approved equal.

4. Mix Proportions

   a. Approved proportion of materials in Engineered Soil shall be as follows:

Component	*By units of weight*	*By percentage*
Crushed Granite Stone	100 dry weight	70.97-74.97
Clay Loam Soil	18 – 21 dry weight	25 – 29
Hydrogel	0.03 dry weight	0.03
Water	10 ± (includes water in other ingredients)	
Other amendments	As recommended by test analysis	

b. During compaction, too much soil will separate stones and remove air spaces –too little soil will not provide adequate water retention.

30-4 EXECUTION

A. Mixing Protocol

1. Spread the crushed stone on a paved surface to maximum depth of six (6) inches. Mix the Hydrogel and sufficient water into slurry and spray over the crushed stone. After the stone is uniformly wetted by the slurry, spread the clay loam evenly over the crushed stone. Spray the remaining water over the soil and mix with a loader of other device until the mix obtains an even consistency. Do not over mix or over wet. If the mix begins to form balls or pellets of soil around the aggregate, discard the batch. Any palletized soil will be rejected.

2. ESM may alternatively be mixed in a commercial pug mill or other equipment approved by the Engineer.

3. Mixing should include any required soil amendments to alter soil fertility including fertilizers of pH adjustment.

4. After completion of the mixing and prior to installation, protect the ESM stockpiles(s) from rain and mix separation through erosion and excessive vibration during handling and placement. Cover the stockpile at all times with plastic sheeting.

5. Contractor shall procure sufficient quantities of ESM in advance of the time needed at the job site to allow adequate time for final quality control testing as required by the progress of the work. ESM shall be stored in piles no larger than 400 cubic yards and each pile shall be numbered for identification and quality control purposes. Storage piles shall be protected from drying out, rain and erosion by covering with plastic sheeting.

B. Delivery Storage and Handling

1. Prior to any delivery of ESM, Contractor shall hold a preconstruction meeting with the Engineer, mixers and operators and submit a logistics plan to discuss schedules, methods and techniques for mixing, delivery and installation of material.

2. Do not deliver or place soils in wet, muddy or frozen conditions. Materials shall be delivered at or near optimum compaction moisture content as determined by ASTM D 698 (AASHTO T 99). Do not delivery or place materials in an excessively

moist condition (beyond 2% above optimum compaction moisture content as determined by ASTM D698 (AASHTO T 99). Protect ESM from drying out, absorbing excess water and from erosion at all times. Do not store materials unprotected from large rainfall events. Do not allow excess water to enter site prior to compaction. If water is introduced into material after grading, allow material to drain or aerate to optimum compaction moisture content. ESM stored longer than two (2) days shall be inspected for water content, rehydrated and remixed as required to meet optimum compaction moisture content.

C. Site Preparation

1. Do not proceed with installation of ESM material until all subsurface drainlines, walls, curb footings, irrigation lines and utility work in the area have been installed. For site elements dependent on ESM for foundation support, postpone installation until immediately after the installation of ESM. All subsurface drainage systems shall be operational prior to the installation of ESM.

2. Excavate and compact the proposed sub-grades to depths, slopes and widths as shown on drawings. Maintain all required angles of repose of the adjacent materials as shown on the drawings. Do not over excavate compacted subgrades of adjacent pavement or structures. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finish grade or toward subsurface drain lines.

3. Excavate existing native soil so that the finish grade of the bottom of the structural soil will be the same grade as the bottom of the planted tree or minimum depth as shown on drawings, whichever depth is deeper. Contractor to verify with tree nursery the depths of the proposed tree rootballs, submit average depths of rootballs to Engineer so that final depth of excavation can be determined.

4. Clean the excavation of all construction debris, trash, rubble and any foreign materials. In the event that fuels, oils, concrete washout silts or other materials harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Fill any over-excavation with approved fill and compact to the required subgrade compaction.

5. Protect adjacent walls, walks and utilities from damage or staining by soil. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day. Any damages to the paving or architectural work caused by the installation of ESM shall be repaired or replaced by the Contractor at no additional cost. Maintain silt and sediment control devices, and provide adequate methods to assure that trucks and other equipment do not track soil from the site.

D. Installation of Engineered Soil Mix

1. Install ESM in six (6) inch lifts and compact every twelve (12) inches to eighteen (18) inches as required. Compact all materials to 95% peak dry density as defined by ASTM D 698 (standard AASHTO compaction curve AASHTO T 99). Hand tamp as necessary to protect utilities, irrigation lines and other subsurface features. Compaction testing procedures and equipment shall be calibrated for non-cohesive soils. No compaction shall occur when moisture content exceeds maximum as listed therein. Delay compaction twenty-four (24) hours if moisture content exceeds maximum allowable and protect ESM during delays in compaction with plastic or plywood as directed by the Engineer.

2. The ESM shall be able to maintain drainage of water at three-quarters (3/4) inch per hour after completion of compaction. Test the completed installation with a minimum of one random percolation test per 300 square feet of area as follows: Dig a hole in the compacted ESM ten (10) inches in diameter and ten (10) inches deep. Fill with water and let it drain completely. Immediately refill with water and time the rate of fall of the water in the hole. The water shall recede at a minimum rate of three-quarters (3/4) inch per hour. All testing shall be done in the presence of the Engineer. In the event that the installation fails to percolate at the required rate, the soil in the area shall be re-tested to determine if it meets the particle size distribution specified. Material that does not meet the specifications shall be removed at no extra cost to the City.

3. Bring ESM to finished grades as shown on the drawings. Immediately protect the ESM material from contamination by toxic materials, trash, debris, water containing cement, clay, silt or material that will alter the particle size distribution of the mix. After the ESM is installed, do not significantly delay, schedule or phase the progress or installation of the next layer of paving and planting above/in the ESM.

4. The Engineer may periodically check the material being delivered and installed at the site for color and texture consistency with the approved sample provided by the Contractor as part of the submittal for ESM. In the event that the installed material varies significantly from the approved sample, the Engineer may request that the Contractor test the installed ESM. Any soil that varies significantly from the approved testing results, as determined by the Engineer, shall be removed and new ESM installed that meets these specifications.

E. Fine Grading

1. After the initial placement and rough grading of the ESM but prior to the start of fine grading, the Contractor shall request review of the rough grading by the Engineer. The Contractor shall set sufficient grade stakes for checking the finished grades. Adjust the finish grades to meet field conditions as directed. Provide smooth transitions between slopes of different gradients and direction. Fill all dips and remove any bumps in the overall plane of the slope. The tolerance for dips and bumps in the ESM areas shall be a three (3) inch deviation from the plane in ten (10) feet. All fine grading shall be inspected and approved by the Engineer prior to the installation of other items to be placed on the ESM.

F. Installation of Filter Fabric

1. After the installation is completed and reviewed by the Engineer, install Filter Fabric on top of ESM in all areas that will be located below paving. Cut off excess fabric at the edge of the Engineered Soil.

G. Clean up

1. Upon completion of ESM installation, clean areas. Remove all excess fill soils, mix stockpiles and legally dispose of all waste materials, trash, and debris. Sweep, do not wash, all paving and other exposed surfaces of dirt and mud until the final paving has been installed over the mix. Avoid washing the area until all paving has been completed.

H. Procedure for Installation of Street Trees in Engineered Soil Mix

1. After the installation of the ESM and Filter Fabric is completed and adjacent pavement has cured and been approved by the Engineer, the street trees can be installed. Do not excavate planting holes until irrigation and drainage systems are tested and approved by Engineer. Locate planting holes in the center of tree well as shown on the plans or required by the Engineer. Notify any conflicts with underground utility lines to the attention of the Engineer. Excavate holes to diameter and depth shown on plans. Avoid over excavating or contaminating ESM with native soil. Stockpile excavated ESM to use as backfill. Cover with plastic sheeting to protect stockpile from contamination and drying out. ESM stockpiled longer than two (2) days shall be inspected for water content, rehydrated and remixed as required to meet optimum compaction moisture content. See Drawing Number 602 for details.

2. Prior to planting, test drainage of plants pits by filling with water twice in succession. Conditions permitting the retention of water in tree pits for more than twelve (12) hours shall be brought to the attention of the Engineer.

3. Handle the tree carefully. Set rootball on bottom of pit and center it in tree well opening. Backfill with ESM and settle with watering. Raise rootballs that settle below accepted finish grade as required by the Engineer.

END OF SECTION

SECTION 31

MISCELLANEOUS SPECIALTIES

31-1 GENERAL

A. Section Includes: All miscellaneous specialties, complete.

B. Shop Drawings: Submit where specified for specialty items, showing dimensions, thicknesses of metal, construction, anchorage and relationship to adjacent materials.

C. Product Data: Submit for all specialty items, showing manufacturer's specifications and installation instructions.

D. Samples: Submit where specified for Specialty Items.

E. Maintenance Data and Materials: Submit for inclusion in City's Operation and Maintenance Manual: two copies of manufacturer's recommended maintenance procedures and two sets of any special tools required for maintenance of Specialty Items.

31-2 PRODUCTS

A. Manufacturers and product numbers for each item are listed in the following paragraphs. Similar and equal items of other manufacturers will be considered for substitution, subject to compliance with requirements with a capacity of two (2) bicycles per inverted "U" shape.

B. Specialty Items: Refer to Drawings for location of individual items.

C. Bicycle Rack:

1. For a completed list of approved bicycle racks and vendors, please contact Transportation Division at 650-329-2520.

2. Material: Two and three-eighths (2 3/8) inch diameter Schedule 40 steel pipe, hot-dip galvanized after fabrication, vinyl coated. The typical city bike rack is: Bikeparking.com Welle Series Rack Surface Flange Mount, black powder coat or approved equal. Specification sheet: http://bikeparking.com/welleseries/wsh3602-sf-spec.pdf

3. Installation: To allow for future removal, install bolt into a threaded sleeve embedded in concrete. Installed parallel to and in the sidewalk, twenty-four (24)

inches from face of curb, depth of threaded sleeve shall be three (3) inches unless otherwise specified.

D. Submittals: Shop drawings; finish sample.

END OF SECTION