100% CONSTRUCTION DOCUMENTS

John F. Kennedy High School

6715 Gloria Drive, Sacramento, CA 95831

HMC #3186067-000
DSA App #02-120928
File #34-H7

Sacramento City Unified School District
5735 47th Avenue, Sacramento, CA 95824

December 20, 2022

HMC Architects

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 02-120928 INC:
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DATE: 12/20/2022

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Sacramento City Unified School District
Sacramento, CA

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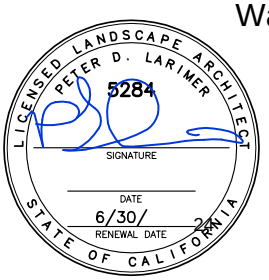
HMC Architects
Architect

Warren Consulting Engineers
Civil Engineer



MTW Group
Landscape Engineer

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SECTION 00 01 10

TABLE OF CONTENTS

END OF TABLE OF CONTENTS

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SECTION 01 57 13.10

EROSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for preparing Storm Water Pollution Prevention Plan.

1.2 SCOPE OF WORK

A. General: Provide all materials, equipment and labor necessary to furnish and install straw wattles or silt fence barriers at locations shown on the Drawings and on Contractors Storm Water Pollution Prevention Plan.

B. Storm Water Pollution Prevention Plan: Prepare a Storm Water Pollution Prevention Plan (SWPPP) tailored to the Contractor's operations, methods and equipment. Comply with State Water Resources Control Board requirements. The SWPPP shall be provided by the Contractor prior to the start of work. The SWPPP shall be tailored to the contractor's approach to the work in this contract. The Contractor shall as a minimum address:

1. Cut and fill operations.
2. Temporary stockpiles.
3. Vehicle and equipment storage, maintenance and fueling operations.
4. Concrete, plaster, mortar and paint disposal.
5. Dust control.
6. Tracking of dirt, mud on off-site streets.
7. Pipe flushing.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:

B. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures

1.4 ACTION SUBMITTALS

A. SWPPP: Contractors Legally Responsible Person (LRP) shall submit to the State Water Resources Control Board via Storm water Multi Application and Report Tracking System (SMARTS) prior to beginning work on site.

1.5 QUALITY ASSURANCE

A. General: Comply with governing codes and regulations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Straw Wattles: New manufactured straw roles in compliance with state requirements for sediment control.

B. Silt Fences: New manufactured silt fence in compliance with state requirements for sediment control.

C. Filter Bag: As required by local jurisdiction.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Straw Wattles: Install per the drawings and/or as required by the SWPPP.

B. Silt Fences: Install per the Drawings and/or as required by the SWPPP. Silt Fences shall not be used around inlets.

C. Filter Bags: Installed as required by manufacturer's requirements.

3.2 MAINTENANCE AND REMOVAL:

A. General: Maintain and repair existing and new erosion control facilities throughout the construction period. Remove silt build up at straw wattles and/or silt fences as needed. Repair damage to earth slopes and banks. Erosion control measures shall be left in place until final paving and landscaping are complete.

B. Monitoring: Provide monitoring of erosion control measures before and after storm events. Provide a daily log of construction activities and impact on erosion control measures. Update SWPPP continuously throughout construction period. Daily log shall be available on site at all times.

C. Cleaning: Keep area clean of debris.

D. Remove erosion control measures prior to placing finish landscaping.

END OF SECTION

SECTION 31 00 00

EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Engineered fill materials.
2. Imported engineered fill material.
3. Landscape backfill material'
4. Decomposed granite.
5. Aggregate base.

1.2 RELATED REQUIREMENTS

A. Section 01 5000, Temporary Facilities and Controls.

B. Section 01 5713, Erosion Control.

C. Section 01 8113, Sustainable Design Requirements, for CAL-Green **[and Collaborative for High Performance Schools (CHPS)]** general requirements and procedures.

D. Section 31 2333, Trenching and Backfilling.

E. Section 32 1200, Asphalt Concrete Paving.

F. Section 32 1600, Site Concrete.

G. Section 32 8000, Irrigation.

H. Section 32 9000, Landscaping.

I. Section 33 0000, Utilities

J. Section 33 4000, Storm Drainage Utilities.

1.3 REFERENCES AND STANDARDS

A. California Building Code (CBC), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

B. California Green Building Standards Code (CAL Green), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

C. Local Jurisdiction: Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.

D. ASTM International (ASTM):

1. D698-00 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
2. D1556-00 - Test Method for Density of Soil in Place by the Sand-Cone Method.
3. D1557-02e2 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
4. D3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).
5. D422-63(2007) e1 Test Method for Particle Size Analysis of Soil.
6. D4318-05 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.

E. CALTRANS Standard Specifications Section 17.

F. CAL-OSHA, Title 8, Section 1590 (e).

G. Site survey: Included in the drawings, was prepared by Warren Consulting Engineers, inc. dated November 18th 2022, and is the basis for data regarding current conditions. While the survey is deemed generally accurate, there exists discrepancies and variations due to elapsed time, weather, etc. Existing dirt grades may vary 0.2 ft. from that shown.

H. Geotechnical Engineering Report: Prepared by Wallace Kuhl & Associates. Report is entitled John F. Kennedy High School Parking Lot Replacement, and is on file with Architect. Soils information is taken from this Report. Contractor is responsible for any conclusions drawn from this data; should he prefer not to assume such risk he is under obligation to employ his own experts to analyze available information and/or to make additional explorations, at no cost to Owner, upon which to base his conclusions. Neither Owner, Soils Engineer nor Architect guarantees information will be continuous over entire site of work.

1.4 ADMINISTRATION REQUIREMENTS

A. Submittal Procedures:

1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.
3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements.

B. Site Visitation: All bidders interfacing with existing conditions shall visit the site prior to bid to verify general conditions of improvements. Discrepancies must be reported prior to the bid for clarification.

1.5 ACTION SUBMITTALS

A. Provide supplier's descriptive literature for all products to demonstrate compliance with specified attributes.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Contractor / Installer.

1.7 CLOSEOUT SUBMITTALS

A. Guarantee: Submit subcontractor’s guarantee.

1.8 QUALITY ASSURANCE

A. Contractor / Installer shall have been in business for five (5) years providing/finishing similar size projects and complexity.

B. Contractor shall be solely responsible for all subgrades built. Failures resulting from inadequate compaction or moisture content are the responsibility of the contractor. Contractor shall be solely responsible for any and all repairs.

C. The representatives of the Owner's testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner's testing lab representatives nor the testing by the Owner's testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting of inadequate compaction or moisture content is the sole responsibility of the contractor.

D. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

E. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Project Inspector. Work not so inspected is subject to uncovering and replacement.

F. Tests (See Part 3, Article “Testing and Observation” for Compaction Testing).

1.9 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle in strict accord with the local jurisdiction.

1.10 FIELD CONDITIONS

1.11 EXISTING SITE CONDITIONS

A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

B. Existing civil, mechanical and electrical improvements are shown on respective site plans to the extent known. Should the Contractor encounter any deviation between actual conditions and those shown, he is to immediately notify the Architect before continuing work.

1.12 ON SITE UTILITY VERIFICATION AND REPAIR PROCEDURES

A. Ground-breaking requirements:

1. All underground work performed by a Contractor must be authorized by the District's Construction Manager or the Low Voltage Consultant prior to start of construction.

2. The Contractor is to obtain and keep the original School's construction utility site plans on site during all excavation operations. Contractor can contact the District's Construction Manager, Facilities Manager, or the Low Voltage Consultant to procure the drawings.

B. Underground Utility Locating:

1. The contractor shall hire an Underground Utility Locating Service to locate existing underground utility pathways in areas effected by the scope of work for excavation.
2. Contractor must use an underground utility locator service with a minimum of 3 years experience. The equipment operator must have demonstrated experience. Contact Norcal Underground Locating (800/986-6722) or Precision Locating (800/577-7324)
3. The Underground Utility Locator Service must have the use of equipment with the ability to locate by means of inductive clamping, induction, inductive metal detection, conductive coupling, or TransOnde (Radiodetection) to generate signals, passive locating (free scoping) for "hot" electric, and metal detector.
4. The Underground Utility Locator Service must be able to locate existing utilities at a depth of at least 72".
5. The Underground Utility Locator Service must be able to locate but are not limited to locating the following types of utility pathways:
    a. All conduit pathways containing 110 volt or greater 50-60Hz electrical wire.
    b. All conduit pathways containing an active cable TV system.
    c. All conduit pathways containing wire or conductor in which a signal can be attached and generated without damaging or triggering the existing systems.
    d. All empty conduit pathways or pipe in which a signal probe or sonde (miniature transmitter) can be inserted.
    e. All conduit pathways containing non-conductive cables or wires in which a signal probe or sonde (miniature transmitter) can be inserted.
    f. All plastic and other nonconductive water lines in which a TransOnde Radiodetection) or other "transmitter" can be applied to create a low frequency pressure waive (signal) without damaging or triggering the existing systems.
    g. All copper or steel waterlines and plastic or steel gas lines.
6. All markings made by the Underground Utility Locator Service or other shall be clear and visible.
7. The contractor shall maintain all markings made by Underground Utility Locator Service or other throughout the entire length of the project.
8. The Underground Utility Locator Service shall provide the contractor with two sets of maps showing the location of utilities and average depth. They will be referenced to permanent buildings. Contractor will deliver one copy to the district at no additional charge.
9. Contractor is responsible to contact Underground Service Alert (U.S.A. 800/227-2600) and receive clearance prior to any excavation operations.
10. Contractor shall inform the (District's Construction Manger)(Architect)(Owner) no later than five (5) days prior to the date scheduled for the utility locator service to be on site.

1.13 PROTECTION

A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.

B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

C. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

D. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gullying of sides of excavation.

E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.

F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.

H. Trees: Carefully protect existing trees that are to remain. Provide temporary irrigation as necessary to maintain health of trees.

1.14 SEASONAL LIMITS

A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

B. Excessively wet fill material shall be bladed and aerated per Article “Subgrade Preparation”.

1.15 TESTING

A. General: Refer to Section 01 4523 - TESTING AND INSPECTION SERVICES, AND STRUCTURAL TESTS AND INSPECTIONS LIST, DSA-103.

B. Geotechnical Engineer: Owner is retaining a Geotechnical Engineer to determine compliance of fill with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will be borne by Owner; except those costs incurred for re-tests or re-inspection will be paid by Owner and backcharged to Contractor.

1. If Contractor elects to process or mine onsite materials for use as Suitable Fill, Aggregate Sub Base, Aggregate Base, Rock, Crushed Rock or sand the cost of all testing of this material shall be paid for by the Contractor.
2. Testing of import fill for compliance with Department of Toxic Substance Control (DTSC) shall be paid for by the Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Engineered Fill Materials: All fill shall be of approved local materials supplemented by imported fill if necessary. "Approved" local materials are defined as local soils tested and approved by Geotechnical Engineer free from debris, and concentrations of clay and organics; and contain rocks no larger than 3-inches in greatest dimension. The soil and rock should be thoroughly blended so that all rock is surrounded by soil. This may require mixing of the soil and rock with a dozer prior to placement and compaction. Clods, rocks, hard lumps or cobbles exceeding 3-inches in final size shall not be allowed in the upper 6 inches of any fill. Native clay or clayey soils will not be permitted within the upper 6 inches of building pad areas or paved areas.

B. Imported Engineered Fill Material: Imported fill may be required to complete work. Proposed import fill material shall meet the above requirements; shall be similar to the native soils. Import fill shall meet the above requirements; shall have plasticity index of 20 or less; an Expansion Index of 50 or less; be free of particles greater than 3-inch (3") in largest dimension; be free of contaminants and have corrosion characteristics within the acceptable limits. All import fill material shall be tested and approved by Soils Engineer prior to transportation to the site. Proposed fill material shall comply with DTSC guidelines to include Phase 1 environmental site assessment and related tests. Refer to the October 2001 DTSC Information Advisory for clean imported fill material.

1. DTSC TESTING: Site work contractor is to coordinate testing with an analytical lab, hired by the owner, licensed by the State of California for the DTSC testing. The costs associated with testing will be paid by the contractor.
2. DTSC testing shall include documentation as to the previous land use, location, and history. Soils shall be analyzed for all compounds of concern to ensure the imported soil is uncontaminated and acceptable. Testing shall be performed per the recommendations included in DTSC Imported Fill Advisory http://www.dtsc.ca.gov/Schools/upload/SMP FS Cleanfill-Schools.pdf). Soils shall be tested prior to import to the project site.
3. Lab shall determine geographically which tests and analysis comparison will be appropriate for the testing. (CAM 17 / Title 22); (RWQCB) Regional Water Quality Control Board; or (OEHHA) Office of Environmental Health Hazard Assessment.
4. Frequency of testing shall be conducted in accordance with DTSC's Imported Fill Advisory as follows;

Fill Material Sample Schedule	
Area Of Individual Borrow Area	**Sampling Requirements**
2 Acres or less	Minimum of 4 samples

2 to 4 Acres	Minimum of 1 sample every ½ acre
4 to 10 Acres	Minimum of 8 samples
Greater than 10 Acres	Minimum of 8 locations with 4 subsamples per location

Volume of Borrow Area Stockpile	
Up to 1,000 Cubic Yards	1 sample per 250 cubic yards
1,000 to 5,000 Cubic Yards	4 samples for the first 1000 cubic yards + 1 sample per each additional 500 cubic yards
Greater than 5,000 Cubic Yards	12 samples for the first 5,000 cubic yards + 1 sample per each additional 1,000 cubic yards

5. Reports/ Documentation
   a. Results of the testing analysis shall be sent to the Owner; Architect; Project Inspector, Project Civil Engineer, DTSC, and DSA. Letter shall reference DSA file and application numbers.

C. Landscape Backfill Material:

1. The top 10" of native topsoil stripped from the site may be used for landscape backfill material provided it meets the requirements as specified in Section [Landscape].
2. Imported Topsoil may be required to complete work. See Section [Landscape] for requirements. Proposed Topsoil material shall comply with DTSC guidelines to include Phase 1 environmental site assessment and related tests. Refer to the October 2001 DTSC Information Advisory for clean imported fill material.

D. Water: Furnish all required water for construction purposes, including compaction and dust control. Water shall be potable.

E. Aggregate Base: Provide Class 2 3/4" Aggregate Base conforming to standard gradation as specified in Cal Trans Standard Specifications, Section 26,-1.02A.

F. Decomposed Granite: Decomposed Granite shall be well graded mixture of fine to 1/8" particles in size with no clods. The material shall be free of vegetation, other soils, debris and rock. The material shall be redish-tan to tan in color.

G. Decomposed Granite Solidifier: PolyPavement or equal.

PART 3 - EXECUTION

3.1 INSPECTION LAYOUT AND PREPARATION

A. Prior to installation of the work of this Section, carefully inspect and verify by field measurements that installed work of all other trades is complete to the point were this installation may properly commence

B. Layout all work, establish grades, locate existing underground utilities, set markers and stakes, setup and maintain barricades and protection facilities; all prior to beginning actual earthwork operations. Layout and staking shall be done by a licensed Land Surveyor or Professional Civil Engineer.

C. Verify that specified items may be installed in accordance with the approved design.

D. In event of discrepancy, immediately notify Owner and the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.2 PERFORMANCE

A. GENERAL:

1. General: Do all grading, excavating and cutting necessary to conform finish grade and contours as shown. All cuts shall be made to true surface of subgrade.
2. Archaeological Artifacts: Should any artifacts of possible historic interest be encountered during earthwork operations, halt all work in area of discovery and immediately contact the Architect for notification of appropriate authorities.
3. Degree of Compaction: Percentage of maximum density, hereinafter specified as degree of compaction required, means density equivalent to that percentage of maximum dry density determined by ASTM D1557 Compaction Test method, and such expressed percentage thereof will be minimum acceptable compaction for specified work.
4. Moisture Content: Moisture content shall be as noted below and as called for on the plans. Moisture content shall be maintained until subgrade is covered by surfacing materials.

3.3 DEMOLITION, DISPOSAL AND DISPOSITION OF UNDESIRABLE MAN-MADE FEATURES

A. All other obstructions, such as abandoned utility lines, septic tanks, concrete foundations, and the like shall be removed from site. Excavations resulting from these removal activities shall be cleaned of all loose materials, dish shaped, and widened as necessary to permit access for compaction equipment. Areas exposed by any required over-excavation should be scarified to a depth of 6", moisture-conditioned to near optimum moisture content, and recompacted to at least 90% of the maximum dry density.

3.4 TESTING AND OBSERVATION

A. All grading and earthwork operations shall be observed by the Geotechnical Engineer or his representative, serving as the representative of the Owner.

B. Field compaction tests shall be made by the Geotechnical Engineer or his representative. If moisture content and/or compaction are not satisfactory, Contractor will be required to change equipment or procedure or both, as required to obtain specified moisture or compaction. Notify Geotechnical Engineer at least 48 hours in advance of any filling operation.

C. Earthwork shall not be performed without the notification or approval of the Geotechnical Engineer or his representative. The Contractor shall notify the Geotechnical Engineer at least two (2) working days prior to commencement of any aspect of the site earthwork.

D. If the Contractor should fail to meet the compaction or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory, as determined by the Geotechnical Engineer or Architect/Engineer.

E. After each rain event Geotechnical Engineer shall test fill material for optimum moisture. Do not place any fill material until desired moisture is achieved.

3.5 CLEARING AND GRUBBING

A. Prior to grading, remove all debris off-site. Remove trees and brush including the root systems. Holes resulting from tree and brush removal should be prepared and backfilled in accordance with paragraphs 3.7, 3.8, 3.9, and 3.10. This may require deepening and/or widening the holes to adequately remove disturbed soil and provide room for compaction equipment. Strip the surface of all organics. Strippings meeting the requirements of Section 32 9000 may be used in landscape areas only.

3.6 CUTTING

A. Building pads that are located within a cut/fill transition area will have to be overexcavated to provide a semi-uniform fill beneath the building pad. The portions of building pads located in cut areas shall be overexcavated to provide no more than 1 foot difference in fill placed in the same building pad.

B. Do all cutting necessary to bring finish grade to elevations shown on Drawings.

C. When excavation through roots is necessary, cut roots by hand.

D. Carefully excavate around existing utilities to avoid unnecessary damage. The contractor shall anticipate and perform hand work near existing utilities as shown on the survey, without additional claims or cost.

3.7 STRUCTURAL EXCAVATION

A. General: Excavate to bear on firm material at contract depth shown on Structural Drawings.

B. Footings: All footing excavations shall be of sufficient width for installation of formwork, unless earth will retain its position during concreting. All portions of footings above grade must be formed. In the event that footings are placed against earth, footing widths below grade shall be increased 2 inches from those shown on Drawings and positive protection shall be provided for top corners of trench.

C. Unsuitable Ground: Any errors in structural excavation, soft ground, or clay soils found when excavating shall be reported to Architect. In no case shall work be built on any such soft or clayey unsuitable surface without direction from the Architect. Restore excavations to proper elevation with engineered fill material compacted to 95% of dry density.

3.8 SUBGRADE PREPARATION

A. Grade compact and finish all subgrades within a tolerance of 0.10' of grades as indicated on Drawings and so as not to pool water. Subgrade within building pads and concrete walks shall be within 0.05' of grades indicated.

B. After clearing, grubbing and cutting, subsurface shall be plowed or scarified to a depth of at least 6", until surface is free from ruts, hummocks or other uneven features. Moisture condition to (optimum) (2% above optimum) moisture content and recompact to at least 95% of the maximum dry density as determined by ASTM Test Method D1557. If the existing soils are at a water content higher than specified, the contractor shall provide multiple daily aerations by ripping, blading, and/or discing to dry the soils to a moisture content where the specified degree of compaction can be achieved. After seven consecutive working days of daily aerations, and the moisture content of the soil remains higher than specified, the contractor shall notify the architect. If the existing soils have a moisture content lower than specified, the contractor shall scarify, rip, water and blade existing soil to achieve specified moisture content. The contractor shall make proper allowance in schedule and methods to complete this work.

C. After subgrade for fill within building pad area or within paved areas has been cleared, plowed and scarified, it shall be disked or bladed until uniform and free from large clods, brought to (optimum) (2% above optimum) moisture content and compacted to not less than 95% of maximum dry density, as determined by ASTM Test Method D1557, and such expressed percentage thereof will be minimum acceptable density for specified work.

D. Subgrade in areas to receive landscaping shall be compacted to (90%).

E. Where Contractor over-excavates building pads through error, resulting excavation shall be recompacted as engineered fill at Contractor's expense.

3.9 PLACING, SPREADING AND COMPACTING FILL MATERIAL IN BUILDING PAD AND PAVEMENT AREAS

A. Selected fill material shall be placed in layers which, when compacted, shall not exceed 6 inches in compacted thickness. Each layer shall be spread evenly and thoroughly mixed to insure uniformity in moisture content.

B. Selected fill material shall be moisture-conditioned to specified moisture content. Selected fill material shall be unfrozen. When moisture content of fill material is below that specified, add water until proper moisture content is achieved. When moisture content is above that specified, aerate by blading or other methods mentioned in 3.08 B until moisture content is satisfactory.

C. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to a minimum of 95% as determined by the ASTM D1557 Compaction Test. Compact each layer over its entire area until desired density has been obtained.

D. Recompaction of Fill in Trenches and Compaction of Fill Adjacent to Walls: Where trenches must be excavated, backfill with material excavated. Place in lifts that when compacted do not exceed 6", moisture conditioned to (optimum)(2% above optimum) moisture content, and compact to a minimum of 95% relative compaction in building pad and paved areas, and to 90% relative compaction in landscape areas.

E. Jetting of fill materials will not be allowed.

3.10 FINAL SUBGRADE COMPACTION

A. Paved Areas: Upper 6" of all final subgrades supporting pavement sections and all other flatwork shall be brought to specified moisture content and shall be uniformly compacted to not less than 95% of maximum dry density, regardless of whether final subgrade elevation is attained by filling, excavation, or is left at existing grade. After acceptance of final compaction test, contractor shall maintain the required moisture content of subgrade until concrete flatwork is placed.

B. Other Fill and Backfill: Upper 6” of all other final subgrades or finish grades shall be compacted to 90% of maximum dry density.

C. Gravel Fill: Do not place compacted gravel fill until after underground work and foundations are in place. Compact gravel fill with vibratory plate or similar equipment to preclude settlement.

3.11 PLACING, SPREADING, AND COMPACTION OF LANDSCAPE BACKFILL MATERIALS

A. All landscaped areas shall receive topsoil. After subgrade under landscape area has been scarified and brought to 95% maximum dry density, top soil shall be placed evenly to depth of 6" at 85% of maximum dry density.

B. Project Inspector must verify that materials are uniformly spread to minimum depth specified.

3.12 SLOPE CONSTRUCTION

A. Cut slopes shall be constructed to no steeper than 1:1 (horizontal:vertical). Fill slopes shall be constructed to no steeper than 1:1 (horizontal:vertical). Prior to placement of fill on an existing slope the existing slope shall be benched. The benches shall be in a ratio of 1 horizontal to 1 vertical. The face of the fill slopes shall be compacted as the fill is placed, or the slope may be overbuilt and then cut back to the design grade. Compaction by track walking will not be allowed.

3.13 FINISH GRADING

A. At completion of project, site shall be finished graded, as indicated on Drawings. Finish grades shall be "flat graded" to grades shown on the drawing. Mounding of finish grades will not be allowed unless otherwise directed on the landscape drawings. Tolerances for finish grades in drainage swales shall be +-0.05'. Tie in new and existing finish grades. Leave all landscaped areas in finish condition for lawn seeding. Landscaped planters shall be graded uniformly from edge of planter to inlets. If sod is used for turf areas the finish grade on which it is placed shall be lowered to allow for sod thickness.

B. All landscape areas shall be left free of rock or foreign material as specified in Section _____.

C. All landscape areas shall be approved by Architect prior to any planting.

3.14 SURPLUS MATERIAL

A. Excavated material not required for grading or backfill shall be removed from site at contractor's expense.

3.15 CLEANING

A. Refer to Section 01 7700.

B. Remove from fill all vegetation, wood, form lumber, casual lumber, and shavings, in contact with ground; buried wood will not be permitted in any fill.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Trench backfill materials.

1.2 RELATED REQUIREMENTS

A. Section 01 5000, Temporary Facilities and Controls.

B. Section 01 8113, Sustainable Design Requirements, for CAL-Green **[and Collaborative for High Performance Schools (CHPS)]** general requirements and procedures.

C. Section 31 0000, Earthwork.

D. Section 32 8000, Irrigation.

E. Section 33 0000, Utilities

F. Section 33 4000, Storm Drainage Utilities.

1.3 REREENCES AND STANDARDS

A. California Building Code (CBC), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

B. California Green Building Standards Code (CAL Green), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

C. California Plumbing Code (CPC), edition as noted on the drawings.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:

1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.
3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements.

B. Coordination:

1. General Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

1.5 ACTION SUBMITTALS

A. Provide supplier’s descriptive literature for all products to demonstrate compliance with specified attributes:

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For contractor / Installer.

1.7 CLOSEOUT SUBMITTALS

A. Guarantee: Submit subcontractor’s guarantee.

1.8 QUALITY ASSURANCE

A. Contractor / Installer shall have been in business for five (5) years providing/finishing similar size projects and complexity.

B. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Project Inspector. Work not so inspected is subject to uncovering and replacement.

1.9 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle in strict accord with the local jurisdiction.

1.10 FIELDCONDITIONS

A. Contractor shall acquaint himself with all existing site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

B. Trench dewatering may be necessary. Contractor shall provide any and all tools, equipment and labor necessary for trench dewatering no matter what the source. Dewatering shall be continuous until all site utilities are installed and backfilled.

1.11 PROTECTION

A. Adequate protection measures shall be provided to protect workers and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations. Repair all trenches in grass areas with new sod (seeding not permitted) and "stake-off" for protection.

B. Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

C. Any construction review of the Contractor's performance conducted by the Architect or Owner is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site.

D. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gullying of sides of excavation.

E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. Keep all excavations free from water during entire progress of work, regardless of cause, source or nature of water.

F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance.

H. Trees: Carefully protect existing trees which are to remain.

1.12 TRENCH SAFETY PROVISIONS

A. General Contractor shall be solely responsible for safety design, construction and coordination with agencies having jurisdiction. If such plan varies from shoring system standards established by Construction Safety Orders, plan shall be prepared by registered civil or structural engineer.

B. Nothing herein shall be deemed to allow use of shoring, sloping or protective system less effective than that required by Construction Safety Orders of California State Division of Industrial Safety.

C. When trenching through paved surface, provide steel trench plates to cover open trenches daily until trenches are backfilled.

1.13 SEASONAL LIMITS

A. No backfill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, full operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

B. Material above optimum moisture shall be processed per Section 31 0000, Part 3, Article “Subgrade Preparation”.

1.14 TESTING

A. General: Refer to Section 31 0000, Part 1, Article “Testing” and Part 3, Article “Testing and Observation”.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill materials: Pipeline and conduit trench backfill as shown on the plans and as specified below.

1. ¾ inch crush rock.
2. Native Materials: Soil native to Project Site, free of wood, organics, and other deleterious substances. Rocks shall not be greater than __-inches.
3. Sand: Fine granular material, free of organic matter, mica, loam or clay.
4. Lean Mix Concrete: 3 sacks of cement per yard plus sand.
5. Class 2 aggregate base, ¾" rock, per Caltrans Section 26-1.02B
6. Controlled Density Fill: 3 sack slurry backfill.

B. Water: Furnish all required water for construction purposes, including compaction and dust control. Water shall be potable.

C. Provide other bedding and backfill materials as described and specified in Section 33 0000, Section 33 4000 and Divisions 22 and 26.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.
2. Identify conditions detrimental to proper or timely completion of work and coordinate with General Contractor to rectify.

3.2 INSTALLATION

A. Perform work in accordance with pipe manufacturer's recommendations, as herein specified and in accordance with drawings.

3.3 TRENCHING

A. Make all trenches open vertical construction with sufficient width to provide free working space at both sides of trench around installed item as required for caulking, joining, backfilling and compacting; not less than 12 inches wider than pipe or conduit diameter, unless otherwise noted.

B. Carefully excavate around existing utilities to avoid unnecessary damage. The contractor shall anticipate and perform hand work near existing utilities as shown on the survey, without additional claims or cost.

C. Trench straight and true to line and grade with bottom smooth and free of edges or rock points.

D. Where depths are not shown on the plans, trench to sufficient depth to give minimum fill above top of installed item measured from finish grade above the utility as follows:

1.	Sewer pipe:	depth to vary
2.	Storm drain pipe:	depth to vary
3.	Water pipe - Fire Supply:	36 inches
4.	Water pipe – Domestic Supply:	30 inches

3.4 BACKFILL

A. Pipe Trench Backfill is divided into three zones:

1. Bedding: Layer of material directly under the pipe upon which the pipe is laid.
2. Pipe Zone: Backfill from the top of the bedding to 6 inches (compacted) over the top of the pipe.
3. Upper Zone: Backfill between top of Pipe Zone and to surface of subgrade.

B. Bedding: Type of material and degree of compaction for bedding backfill shall be as defined in the Details and Specifications.

C. Pipe Zone and Upper Zone Backfill:

1. Type of material and degree of compaction Pipe Zone and Upper Zone Backfill shall be as required by Drawings, Details, & Specifications.
2. Upper Zone Backfill shall not be placed until conformance of Bedding and Pipe Zone Backfill with specified compaction test requirements has been confirmed.
3. Backfill shall be brought up at substantially the same rate on both sides of the pipe and care shall be taken so that the pipe is not floated or displaced. Material shall not be dropped directly on pipe.

D. Backfill Compaction:

1. Backfill shall be placed in layers which, when compacted shall not exceed 6 inches in thickness. Each layer shall be spread evenly and thoroughly mixed to insure uniformity. Do not backfill over, wet, frozen or soft subgrade surfaces. Employ a placement method that does not disturb or damage foundation walls, perimeter drainage, foundation damp-proofing, waterproofing or protective cover.
2. When moisture content of fill material is below that required to achieve specified density, add water until proper moisture content is achieved. When moisture content is above that required, aerate by blading or other methods until specified moisture content is met; see Section 31 0000, Part 3, Article “Subgrade Preparation”.
3. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to ____% of maximum dry density while at specified moisture content. Compact each layer over its entire area until desired density has been obtained.

4. Compaction: All backfill operations shall be observed by the Inspector of Record and/or Geotechnical Engineer. Field density tests shall be made to check compaction of fill material. If densities are not satisfactory, Contractor will be required to change equipment or procedure or both, as required to obtain specified densities. Notify Inspector and Architect at least 24 hours in advance of any operation.

E. Backfill in Areas Previously Lime or Cement Treated

1. Where trenching occurs in areas that have been lime or cement treated, class 2 aggregate bases or approved controlled density backfill material shall be used for the top 12-inches minimum of the trench or thickness shall match the depth of treated material.

3.5 TRENCH AND SITE RESTORATION

A. Finished surface of trenches shall be restored to a condition equal to, or better than the condition as existed prior to excavation work.

3.6 PROTECTION

A. Protect existing surfaces, structures, and utilities from damage. Protect work by others from damage. In the event of damage, immediately repair or replace to satisfaction of Owner.

B. Repair existing landscaped areas to as new condition. Replant trees, shrubs or groundcover with existing materials if not damaged or with new materials if required. Replace damaged lawn areas with sod, no seeding will be permitted.

C. Replace damaged pavement with new compatible matching materials. Concrete walks to be removed to nearest expansion joint and entire panel replaced. Asphalt to be cute neatly and replaced with new materials.

D. Any existing materials removed or damaged due to trenching to be returned to new condition.

3.7 SURPLUS MATERIAL

A. Remove excess excavated material, unused materials, damaged or unsuitable materials from site.

3.8 CLEANING

A. Refer to Section 01 7700.

B. Contractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others throughout the project and at the completion of work.

C. After completion of work in this section, remove all equipment, materials, and debris. Leave entire area in a neat, clean, acceptable condition.

END OF SECTION

SECTION 31 31 00

SOIL TREATMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lime Treated Engineered Fill.

1.2 RELATED REQUIREMENTS

A. Section 01 2200, Unit Prices.

B. Section 01 5000, Temporary Facilities and Controls.

C. Section 01 8113, Sustainable Design Requirements, for CAL-Green **[and Collaborative for High Performance Schools (CHPS)]** general requirements and procedures.

D. Section 31 2333, Trenching and Backfilling.

E. Section 32 1200, Asphalt Concrete Paving.

F. Section 32 1600, Site Concrete.

G. Section 31 0000, Utilities.

H. Section 33 4000, Storm Drainage Utilities.

1.3 REFERENCES AND STANDARDS

A. California Building Code (CBC), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

B. California Green Building Standards Code (CAL Green), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

C. ASTM International (ASTM):

1. D1557-02e2 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Submittals Procedures:

1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.

3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Contractor / Installer.

B. Weighmaster Certificates: Provide certificates as required in Article “Materials” Paragraph “Lime”.

1.6 CLOSEOUT SUBMITTALS

A. Guarantee: Submit subcontractor’s guarantee.

1.7 QUALITY ASSURANCE

A. Contractor / Installer shall have been in business for five (5) years providing/finishing similar size projects and complexity.

B. Contractor shall be solely responsible for all subgrades built. Any repairs resulting from inadequate compaction is the responsibility of the contractor.

C. The representatives of the Owner’s testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner’s testing lab representatives nor the testing by the Owner’s testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting inadequate compaction is the sole responsibility of the contractor.

D. Testing:

1. Geotechnical Engineer: Owner is retaining a Geotechnical engineer to determine compliance of Lime Stabilization Treatment with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will be borne by Owner; except that costs incurred for re-tests or re-inspection will be paid by Owner and backcharged to Contractor.

E. Inspection: Work shall not be performed without the physical presence and approval of Geotechnical Engineer. The Contractor shall notify the Geotechnical Engineer at least two working days prior to commencement of any aspect of site earthwork.

F. Field Density: Field density and phenolphthalein reaction tests shall be made by the Geotechnical Engineer after completion of compaction. Where compaction equipment has disturbed the surface to a depth of several inches, density tests shall be taken in the compacted material below the disturbed surface.

G. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

H. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Project Inspector. Work not so inspected is subject to uncovering and replacement.

I. Tests (See Part 3, Article “Spreading and Compaction” for Compaction Testing).

1.8 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle in strict accord with the local jurisdiction.

1.9 FIELD CONDITIONS

A. Lime shall not be spread while the atmospheric temperature is below 35 degrees Fahrenheit or when conditions indicate that the temperature may fall below 35 degrees Fahrenheit within 24 hours.

B. Lime-treated material shall not be mixed or spread while the atmospheric temperature is below 35°F.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lime Treated Engineered Fill: The materials to be treated shall consist of on-site soils or approved import material as described in Section 31 0000.

B. Lime: Lime in areas to be treated shall be lime. The percentage of lime shall be based on a soil weight of 100 pcf; hence, 2 pounds lime should be utilized per square foot. A certification of compliance shall be submitted to the Geotechnical Engineer with each delivery of lime/cement.

C. Water: Water shall be added during the preliminary mixing operations and, if necessary, during final mixing and to keep the cured material moist until curing is complete. The amount of water added shall be subject to the approval of the Geotechnical Engineer at all times.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Layout all work, establish grades, locate existing underground utilities, set markers and stakes, set up and maintain barricades and protection facilities; all prior to beginning actual earthwork operations.

3.2 EQUIPMENT

A. Lime Spreader: The lime shall be spread by equipment which shall uniformly distribute the required amount of lime. The rate of spread per square foot of blanket shall not vary more than 5 percent from the designated rate, unless otherwise approved by the Geotechnical Engineer.

B. Mixing Equipment: Mixing equipment shall be capable of mixing or remixing the materials to a uniform mixture free of streaks or pockets of lime to the full required depth.

3.3 START OF WORK UNDER THIS SECTION

A. General: Prior to starting physical work under this Section, the property line is to be clearly staked and identified. No lime treated materials shall be allowed to contaminate areas outside of the property.

3.4 LIME SPREADING

A. Engineered Fill: Provide lime/cement treatment in areas shown on plans, to a depth of at least 12-inches.

3.5 MIXING

A. Lime/cement shall be added to the material to be treated at a rate of 4.5 pounds lime per square foot based on a soil unit weight of 115 pcf.

B. Lime shall be spread by equipment that will uniformly distribute the required amount of lime for the full width of the prepared material. The rate of spread per linear foot of blanket shall not vary more than five percent (5%) from the designated rate.

C. The spread lime shall be prevented from blowing by suitable means selected by the Contractor. Quicklime shall not be used to make lime slurry. The spreading operations shall be conducted in such a manner that a hazard is not present to construction personnel or the public. All lime spread shall be thoroughly mixed into the soil the same day lime spreading operations are performed.

D. The distance which lime may be spread upon the prepared material ahead of the mixing operation will be determined by the Geotechnical Engineer.

E. No traffic other than the mixing equipment will be allowed to pass over the spread lime until after the completion of mixing.

F. Mixing equipment shall be equipped with a visual depth indicator showing mixing depth, an odometer or footmeter to indicate travel speed and a controllable water additive system for regulating water added to the mixture.

G. Mixing equipment shall be of the type that can mix the full depth of the treatment specified and leave a relatively smooth bottom of the treated section. Mixing and re-mixing, regardless of equipment used, will continue until the material is uniformly mixed (free of streaks or pockets of lime), moisture is at approximately two percent (2%) over optimum and the mixture complies with the following requirements:

Minimum Sieve Size	**Percent Passing**
1-1/2 inch	100
1 inch	95
No. 4	60

H. Non-uniformity of color reaction when the treated material, exclusive of one inch or larger clods, as tested with the standard phenolphthalein alcohol indicator, will be considered evidence of inadequate mixing.

I. The entire mixing operation shall be completed within seventy-two (72) hours of the initial spreading of lime, unless otherwise permitted by the Geotechnical Engineer.

3.6 SPREADING AND COMPACTING

A. The treated mixture shall be spread to the required width, grade and cross-section. The maximum compacted thickness of a single layer may be determined by the Contractor provided he can demonstrate to the Geotechnical Engineer that his equipment and method of operation will provide uniform distribution of the lime and the required compacted density throughout the layer. If the Contractor is unable to achieve uniformity and density throughout the thickness selected, he shall rework the affected area using thinner lifts until a satisfactory treated subgrade meeting the distribution and density requirements is attained, as determined by the Geotechnical Engineer, at no additional cost to the Owner.

B. The finished thickness of the lime-treated material shall not vary more than one-tenth foot (0.1') from the planned thickness at any point.

C. The lime-treated soils shall be compacted to a relative compaction of not less than 95 percent (95%) as determined by the ASTM D1557 Compaction Test.

D. Initial compaction shall be performed by means of a sheepsfoot type roller or a vibratory padfoot roller. Final rolling shall be by means of a smooth drum roller.

E. Areas inaccessible to rollers shall be compacted to meet the minimum compaction requirement by other means satisfactory to the Geotechnical Engineer.

F. Final compaction shall be completed within thirty-six (36) hours of final mixing. The surface of the finished lime-treated material shall be the grading plane and at any point shall not very more than eight one hundredths of a foot (0.05') foot above or below the grade established by the Civil Engineer except that when the lime-treated material is to be covered by material which is paid for by the cubic yard the surface of the finished lime-treated material shall not extend above the grade established by the Civil Engineer.

G. Before final compaction, if the treated material is above the grade tolerance specified in this section, uncompacted excess material may be removed and used in areas inaccessible to mixing equipment. After final compaction and trimming, excess material shall be removed and disposed of. The trimmed and completed surface shall be rolled with steel or pneumatic-tired rollers. Minor indentations may remain in the surface of the finished materials so long as no loose material remains in the indentations.

H. At the end of each day's work, a construction joint shall be made in thoroughly compacted material and with a vertical face. After a part-width section has been completed, the longitudinal joint against which additional material is to be placed shall be trimmed approximately three inches (3") into treated material, to the neat line of the section, with a vertical edge. The material so trimmed shall be incorporated into the adjacent material to be treated.

I. An acceptable alternate to the above construction joints, if the treatment is performed with cross shaft rotary mixers, is to actually mix three inches (3") into the previous day's work to assure a good bond to the adjacent work.

3.7 FINAL GRADING

A. Finish all lime treated engineered fill grades to within a tolerance of 1/100 foot of grades shown for top of lime stabilization treatment.

B. Leave all areas in suitable condition for subsequent work.

C. Excess materials not needed for final grading operations shall be removed from the site.

3.8 CURING

A. Curing: The surface of compacted and finish graded lime treated soils shall be kept moist until covered by pavement surface or crushed rock layer for buildings.

END OF SECTION

SECTION 32 12 00

ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aggregate.
2. Asphalt paving.
3. Seal coat.
4. Wood headers and stakes.
5. Pavement marking.
6. Precast concrete bumpers.

1.2 RELATED REQUIREMENTS

A. Section 01 5000, Temporary Facilities and Controls.

B. Section 01 6116, Volatile Organic Compound (VOC) Restrictions, for VOC limits pertaining to adhesives, sealants, fillers, primers, and coatings.

C. Section 01 8113, Sustainable Design Requirements, for CAL-Green **[and Collaborative for High Performance Schools (CHPS)]** general requirements and procedures.

D. Section 31 0000, Earthwork.

E. Section 31 2333, Trenching and Backfilling.

F. Section 32 8000, Irrigation.

G. Section 33 0000, Utilities.

H. Section 33 4000, Storm Drainage Utilities.

1.3 REFERENCES AND STANDARDS

A. California Building Code (CBC), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

B. California Green Building Standards Code (CAL Green), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

C. Local Jurisdiction: Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.

D. ASTM International (ASTM):

1. D698-00 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
2. D1556-00 Test Method for Density of Soil in Place by the Sand-Cone Method.
3. D1557-02 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
4. D6628-16 Standard Specification for Color of Pavement Marking Materials.
5. D3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).
6. D4318-05 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.

E. CALTRANS Standard Specifications.

F. CAL-OSHA, Title 8, Section 1590 (e).

1.4 ADMINISTRATION REQUIREMENTS

A. Submittal Procedures:

1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.
3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements.

1.5 ACTION SUBMITTAS

A. Provide supplier’s descriptive literature for all products to demonstrate compliance with specified attributes.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Contractor / Installer.

B. Sustainable Design:

1. General
   a. Submit information necessary to establish and document compliance with the California Green Building Standards Code.
   b. Sustainable design submittals are in addition to other submittals.
2. The following information shall be provided:
   a. Adhesives and Sealants: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.
   b. Paints and Coatings: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.

1.7 CLOSEOUT SUBMITTALS

A. Guarantee: Submit subcontractor’s guarantee.

1.8 QUALITY ASSURANCE

A. Contractor / Installer shall have been in business for five (5) years providing/finishing similar size projects and complexity.

B. Contractor shall be solely responsible for all subgrades built. Any repairs resulting from inadequate compaction is the responsibility of the contractor.

C. The representatives of the Owner's testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner's testing lab representatives nor the testing by the Owner's testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting inadequate compaction is the sole responsibility of the contractor.

D. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

E. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Project Inspector. Work not so inspected is subject to uncovering and replacement.

F. Contractor shall provide verification that asphalt mix temperature meets the requirements of this specification at time of application.

G. Tests (See Part 1, Article "Testing").

1.9 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle in strict accord with the local jurisdiction.

1.10 FIELD CONDITIONS

A. Environmental Requirements:

1. Base Course: Do not lay base course on muddy subgrade, during wet weather, or when atmospheric temperature is below 40 degrees F.
2. Asphalt Surfacing: Do not apply asphaltic surfacing on wet base, during wet weather, or when atmospheric temperature is below 50 degrees F.

1.11 EXISTING SITE CONDITIONS

A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

1.12 PROTECTION

A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.

B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

C. Any construction review of the Contractor's performance conducted by the owner's representative is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

D. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.

E. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

F. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.

1.13 SEASONAL LIMITS

A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

1.14 TESTING

A. General: Refer to Section 01 4523 – TESTING & INSPECTION SERVICES AND STRUCTURAL TESTS AND INSPECTIONS LIST, DSA-103.

B. Geotechnical Engineer: Owner is retaining a Geotechnical Engineer to determine compliance of fill with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will be borne by Owner; except those costs incurred for re-tests or re-inspection will be paid by Owner and backcharged to Contractor.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Sustainable Design:

1. VOC emissions for field-applied adhesives, sealants, and sealant primers must comply with limits specified in Section 01 6116.
2. VOC emissions for field-applied paints and coatings must comply with limits specified in Section 01 6116.

2.2 MATERIALS

A. Sterilant: Soil sterilizer shall be CIBA GEIGY's Pramatol 25-E, Treflan EC or Thompson-Hayward Casoron.

1. Soil sterilizer shall be applied in strict accordance with manufacturer's instructions.

B. Base Course Aggregate: State Specifications, Section 26, Class 2 aggregate base (3/4" max.).

C. Asphalt Binder: Steam-refined paving asphalt conforming to State Specifications, Section 92, viscosity grade PG 64-10. Asphalt binder additives for HMA per Caltrans approved list of manufacturers.

D. Liquid Asphalt Tack Coat: Per CALTRANS section 94.

E. Surface Course Aggregate: Mineral aggregates for Type "B" asphalt concrete, conforming to State Specifications 39-2.02, Type B, ½" maximum, medium gradient. 3/8" maximum gradient at Playcourt.

F. Seal Coat: shall be a pre-mixed asphalt emulsion blended with select fillers and fibers such as:

1. "Park-Top No. 302", Western Colloid Products.
2. "Overcoat", Reed and Gram.
3. "Drivewalk", Conoco Oil.

G. Wood Headers and Stakes: Pressure treated.

H. Pavement Marking: Colors as directed by Architect. Colors of painted traffic stripes and pavement markings must comply with ASTM D6628.

1. Waterborne traffic line - colors white, yellow and red, State specification PTWB-01R3.
2. Waterborne traffic line for the international symbol of accessibility and other curb markings – blue, red and green, Federal specification TT-P-1952F.

I. Precast Concrete Bumpers: 3000 psi at 28 day minimum strength; 48" length unless otherwise indicated; provide with steel dowel anchors and concrete epoxy.

J. Pavement Epoxy; K-Lite; Ktepx-590; Ennis Epoxy HPS2 or an approved equal.

K. Crack Filler; QPR model CAR08, 10oz asphalt crack filler; Star STA-FLEX Trowel Grade crack filler or approved equal.

L. Reclaimed Asphalt Paugment (RAP). HMA Type A or Type B may be produced using RAP providing it does not exceed 15% or the aggregate blend.

2.3 MIXES

A. General: Plant mixed conforming to State Specifications, Section 39, Type B, ½" maximum, medium grading. 3/8" maximum grading shall be used at hardcourt.

B. Temperature of Hot Mix Asphalt: Not less than 275 degrees F nor more than 325 degrees F when added to aggregate.

C. Temperature of Hot Mix Aggregate: Not less than 250 degrees F nor more than 325 degrees F when asphalt is added.

D. Temperature of Hot Mix Asphalt Concrete: Asphalt shall be not less than 285 degrees at time of application, nor more than 350 degrees. Asphalt not meeting the required temperature shall not be used.

E. Temperature of Warm Mix Asphalt: Mixing and placement; per the approved manufactures heat range recommendations for mixing and placement.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Conditions of Work in Place: Subsurfaces which are to receive materials specified under this Section shall be carefully examined before beginning work hereunder, and any defects therein shall be reported, in writing, to the Architect. Work shall not be started until such defects have been corrected. Starting of work shall imply acceptance of conditions as they exist.

3.2 PREPARATION

A. Sub-Grade: Clean, shape and compact to hard surface free from elevations or depressions exceeding 0.05’ in 10' from true plan. Compact per Section 31 0000. Compaction and moisture content shall be verified immediately prior to placement of aggregate base. Proof roll subbase in presence of geotechnical engineer prior to placement of aggregate base.

3.3 INSTALLATION

A. Headers:

1. General: Install as edging to asphalt paving, except where adjoining existing pavement, concrete curbs, walks or building.
2. Existing Headers: Remove existing headers where new paving will join existing. Saw cut existing asphalt to provide clean edge.
3. Lines and Levels: Install true to line and grade. Cut off tops of stakes 2-inches below top of header so they will not be visible on completion of job.

B. Asphalt Paving:

1. Base Course: Install in accord with State Specifications, Section 26. Compact to relative compaction of not less than 95%, ASTM D1557. The material shall be deposited on the subgrade in such a manner as to provide a uniform section of material within five percent tolerance of the predetermined required depth. Deposition will be by spreader box or bottom dump truck to prevent segregation of the material. The material so deposited on the subgrade shall have sufficient moisture which, in the opinion of the Architect is adequate to prevent excessive segregation. It shall then be immediately spread to its planned grade and cross section. Undue segregation of material, excessive drifting or spotting of material will not be permitted. If in the opinion of the site geotechnical engineer, the material is unsuitably segregated, it shall be removed or completely reworked to provide the desired uniformity of the material.
    a. Moisture content and compaction of base material shall be tested immediately prior to placement of asphalt paving.

2. Sterilant: Apply specified material at manufacturer's recommended rate. Applicator of sterilant material shall be responsible for determining location of all planter areas. Apply specified material over entire base course area just prior to application of asphalt. Follow manufacturer's printed directions.
3. Liquid Asphalt Tack Coat: Apply as "tack coat" to all vertical surfaces of existing paving, curbs, walks, and construction joints in surfacing against which paving is to be placed.
4. Asphalt Concrete Surface Course:
    a. Comply with State Specifications, 39-6 except as modified below.
        1) Final gradation shall be smooth, uniform and free of ruts, humps, depressions or irregularities, with a minimum density of 91% of the theoretical maximum specific gravity determined by California Test Method #309. Maximum variation 1/8 inch in 10' when measured with steel straightedge in any one direction. Test paved areas for proper drainage by applying water to cover area. Correct portions that do not drain properly by patching with plant mix. In no case shall accessible parking spaces or loading and unloading areas exceed 2% slope in any direction.
        2) Asphalt material shall be delivered to the project site in a covered condition to maintain acceptable temperature.
5. Placement and adjustment of Frames, Covers, Boxes and Grates: The Contractor shall set and adjust to finish grade all proposed and existing frames, covers, boxes, and grates of all manholes, drop inlets, drain boxes, valves, cleanouts, electrical boxes and other appurtenant structures prior to placement of asphaltic concrete.
6. Water Testing: All paved areas shall be water tested, to check drainage, in the presence of the project inspector prior to placement of seal coat. The surface of asphalt paving shall not vary more than 1/8 inch above or below the grade established on the plans. If variations in grade are present, they will be corrected by overlaying paving and/or pavement removal and replacement as directed by the Architect.
7. Patching: Cut existing paving square and plumb at all edges to be joined by new paving. In trenches; grind existing asphalt on each side of trench 3” wide x ½ the depth of the section. Apply tact coat to vertical surfaces before installing new work. Warp carefully to flush surface, with seal over joints, and feather edge. Sawcut, remove and patch existing paving where cutting is necessary for installation of piping or conduits under Divisions 15, 16 and 33.
8. Seal Coat:
    a. Seal coat shall be applied no sooner than 30 days from time of asphalt placement.
    b. Surface Preparation: surface shall be clean of all dirt, sand, oil or grease. Hose down entire area with a strong jet of water to remove all debris. Remove soft, loose, or otherwise damaged areas of asphalt concrete to full depth of damage and replace with compacted asphalt concrete as specified herein. Minor holes and imperfections may be patched using hot mix asphalt or mastic using sand/SS-1-H. Use wire brush for removal of oil and grease; prime with shellac or synthetic resin as recommended by manufacturer of pavement sealer material.

c. Seal Coat Seal Application: Thoroughly mix materials in the presence of the onsite inspector. Failure to do so will be cause for rejection. Apply in accordance with manufacturer's written instructions.
   a. The minimum application rate for each applied coat shall be 30gals per 1000 sq. ft. Two coats of sealcoat will be required.
   b. Clean-Up and Precautions: As recommended by pavement sealer material manufacturer.

d. Clean-Up and Precautions: As recommended by pavement sealer material manufacturer.

C. Pavement Marking: painted pavement markings shall be done only after the seal coat has thoroughly dried. On clean surfaces to be painted with traffic paint of dust, dirt, grime, oil, rust or other contaminants which will impair the quality of work or interfere with proper bond of paint coats. Surfaces shall be cleaned to the extent and by whatever means that will satisfactorily accomplish the purpose without damage to asphalt concrete. Provide measured layouts, temporary markings, templates, and other means necessary to provide required marking. Prepare and apply paint in accordance with manufacturer's instructions; paint shall be applied by spray and shall achieve complete coverage free from voids and thin spots. Where indicated on the Drawings, paint parking stall strips, lettering, arrows, accessible symbols, playground markings, game striping, maps, etc. on concrete paving or asphalt concrete paving. Paint stripes shall be 4 inches wide (except otherwise indicated) and applied with two (2) coats of herein specified Traffic Line Paint; white (except as otherwise specified or indicated).

1. International Accessible Symbol: Symbol shall be white figures on a blue background. Blue shall be equal to color No. 15090 in Fed. Std. 595c. Lines and symbols shall be accurately formed and true to line and form; lines shall be straight and uniform in width. Painted edges shall be clean cut and free from raggedness, and corners shall be cut sharp and square. Tolerances: Apply striping within a tolerance 1/2 inch in 50 feet. Apply markings and striping to widths indicated with a tolerance of 1/4 inch on straight sections and 1/2 inch on curved sections.

D. Colors: As directed by Architect

E. Precast Concrete Bumpers: Install where shown, using steel dowels, and epoxy applied for length to wheel stop without damage to bumpers or asphalt concrete paving.

3.4 CLEANING

A. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.

B. Clean excess material from surface of all concrete walks and utility structures.

END OF SECTION

SECTION 32 16 00

SITE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete curbs and gutters.
2. Concrete pavement, sidewalks and ramps.
3. Steel reinforcing for flatwork and curbs.
4. Truncated domes.

1.2 RELATED REQUIREMENTS

A. Section 01 4523, Testing & Inspection Services.

B. Section 01 6116, Volatile Organic Compound (VOC) Restrictions; for VOC limits pertaining to adhesives, sealants, fillers, primers, and coatings.

C. Section 01 8113, Sustainable Design Requirements, for CAL-Green **[and Collaborative for High Performance Schools (CHPS)]** general requirements and procedures.

D. Section 03 1000, Concrete Forming & Accessories.

E. Section 03 2000, Concrete Reinforcing.

F. Section 03 3000, Cast-in-Place Concrete.

G. Section 09 9623, Graffiti-Resistant Coatings.

H. Division 31, Earthwork.

I. Section 32 1200, Asphalt Concrete Paving.

1.3 REFERENCES AND STANDARDS

A. California Building Code (CBC), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

B. California Green Building Standards Code (CALGreen), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

C. American Concrete Institute (ACI):

1. 117: Specification for Tolerances for Concrete Construction and Materials and Commentary.
2. 211.1: Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
3. 301: Specifications for Structural Concrete.

4. 302.1R: Guide to Concrete Floor and Slab Construction.
5. 305R: Guide to Hot Weather Concreting.
6. 306R: Guide to Cold Weather Concreting.
7. 308R: Guide to External Curing of Concrete.
8. 318: Building Code Requirements for Structural Concrete and Commentary.
9. 347R: Guide to Formwork for Concrete.

D. ASTM International (ASTM):

1. A615/A615M: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
2. A706/A706M: Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
3. C33/C33M: Standard Specification for Concrete Aggregates.
4. C94/C94M: Standard Specification for Ready-Mixed Concrete.
5. C143/C143M: Standard Test Method for Slump of Hydraulic-Cement Concrete.
6. C150C150M: Standard Specification for Portland Cement.
7. C260/C260M: Standard Specification for Air-Entraining Admixtures for Concrete.
8. C309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
9. C330/C330M: Standard Specification for Lightweight Aggregates for Structural Concrete.
10. C494/C494M: Standard Specification for Chemical Admixtures for Concrete.
11. C618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
12. C920: Standard Specification for Elastomeric Joint Sealants.
13. C1107/C1107M: Standard Specification for Packaged Dry, Hydraulic Cement Grout (Non-Shrink).
14. C1315: Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
15. D1751: Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
16. D5893/D5893M: Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.

E. Concrete Reinforcing Steel Institute (CRSI):

1. Manual of Standard Practice.
2. Placing Reinforcing Bars.

F. State of California, Department of Transportation (Caltrans):

1. Division of Engineering Services:
   a. California Test 342: Method of Test for Surface Skid Resistance with the California Portable Skid Test.
2. Standard Specifications.

a. Section 51, Concrete Structures.
b. Section 52, Reinforcement.
c. Section 73, Concrete Curbs and Sidewalks.
d. Section 90, Concrete.

G. US Government General Services Administration (GSA/SAE):

1. GSA/SAE AMS-STD-595A: Colors Used In Government Procurement.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:

1. Action Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.
3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements.

1.5 ACTION SUBMITTALS

A. Shop Drawings: Joint pattern layout for walks and pavement.

B. Product Data:

1. A complete list of materials proposed to be used for the site concrete work including, but not limited to, sand, gravel, admixtures, surface treatments, coloring agents, sealers, cast-in-place accessories, forming and curing products, concrete mix designs, reinforcing materials, joint materials, curing materials, and detectable warning surface.
2. Manufacturer's descriptive literature for products proposed for use. Include installation instructions, and maintenance instructions.

C. Concrete Mix Design: The Contractor shall submit three copies of each proposed mix design for each class of concrete in accordance with ACI 301, Sections 3.9 "Proportioning on the Basis of Previous Field Experience or Trial Mixture," or 3.10 "Proportioning Based on Empirical Data." The Contractor shall submit a separate mix design for concrete to be placed by pumping, in addition to the mix design for concrete to be placed directly from the truck chute.

1. The following information shall be included in the concrete mix design:
   a. Proportions of cement, fine and coarse aggregate, and water.
   b. Water-cement ratio, 28-day compressive design strength, slump, and air content.
   c. Type of cement and aggregate.
   d. Special requirements for pumping.
   e. Range of ambient temperature and humidity for which design is valid.
   f. Special characteristics of mix, which require precautions in mixing, placing, or finishing techniques to achieve specified finished product.

2. Do not begin concrete production until mixes have been reviewed and approved by Engineer.
    a. Review of mix design by the Architect and Engineer shall in no way relieve the subcontractor of his responsibility for the performance of the concrete.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer

B. Delivery tickets as specified for ready-mixed concrete.

C. Record of pre-installation meeting.

D. Sustainable Design:

1. General:
    a. Submit information necessary to establish and document compliance with the California Green Building Standards Code.
    b. Sustainable design submittals are in addition to other submittals.
2. The following information shall be provided:
    a. Adhesives and Sealants: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.
    b. Paints and Coatings: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.

1.7 CLOSEOUT SUBMITTALS

A. Guarantee: Submit subcontractor’s guarantee.

1.8 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer of ready-mixed concrete products shall meet ASTM C94/C94M requirements for production facilities and equipment.

B. Design, erect, support, brace and maintain formwork and shoring to safely support all loads that might be applied until such loads can be carried by concrete.

C. The Contractor shall perform work in accordance with ACI 301.

D. Use only new materials and products.

E. Single-Source Responsibility: Use materials and products of one manufacturer whenever possible.

F. Materials, components, assemblies, workmanship and installation are to be observed by the Owner's Project Inspector. Work not so inspected is subject to uncovering and replacement.

G. Testing to determine compliance with the work of this Section will be the responsibility of the Contractor.

1. Cement and reinforcing shall be tested in accordance with CBC Section 1910A. Testing of reinforcing may be waived in accordance with Section 1910A.2 when approved by the Engineer and DSA.
2. Testing will be performed by an independent testing and inspecting agency in accordance with Section 01 4523, Testing and Inspection Services, and paid for by the Owner.
3. Refer to Article FIELD QUALITY CONTROL in Part 3 of this Section for additional requirements.
4. Cost of retests and coring due to low strength or defective concrete will be paid by the Owner and back-charged to the Contractor.

H. Sieve analysis from testing laboratories identifying rock/sand percentages within the concrete mix; or class 2 aggregate base shall have the current Project name and Project location identified on the report. Outdated analytical reports greater than 90 days old will not be accepted.

I. Mockups: Provide on-site mockup panels for each type of exposed colored concrete flatwork showing texture and color before proceeding with finish to be used on this Project.

1. Construct sample panels after review and approval of samples.
2. Size: Minimum 5 feet square and have at least one longitudinal and one transverse joint unless a more specific note indicates otherwise on Drawings.
3. Construct sample panels at location approved by Architect.
4. Construct sample panels in ample time to allow for finishing and curing before requesting Architect to review.
5. Follow procedures used on accepted samples.
6. Include saw-cut and tooled joints to match method and appearance proposed for use in completed work.
7. Prepare successive sample panels as required until finish, color, and appearance is approved by Architect.
8. Do not remove sample panels until authorized in writing by the Architect and all concrete work has been approved.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the Work.

C. Transport, store and handle in strict accordance with the manufacturer's written recommendations.

D. Store cement in weather tight building, permitting easy inspection and identification. Protect from dampness. Lumpy or stale cement will be rejected.

E. Aggregates: Prevent excessive segregation, or contamination with other materials or other sizes of aggregate. Use only one supply source for each aggregate stock pile.

1.10 FIELD CONDITIONS

A. Make and be responsible for all field dimensions necessary for proper fitting, slopes, and completion of work. Report discrepancies to Architect before proceeding.

B. Do not place concrete during rain without adequate protection.

C. The Contractor shall conform to ACI 306R when mixing and placing concrete during cold weather. Provide sufficient protection when daily temperatures drop below 40 degrees F.

D. The Contractor shall conform to ACI 305R when mixing and placing concrete during hot weather. When air temperature exceeds 100 degrees F adjust concrete mix with retarding admixture in design mix, and adequately test and take additional measures as directed by concrete supplier.

E. The Contractor shall maintain access for vehicular and pedestrian traffic as required for other construction activities. Use temporary striping, flagmen, barricades, warning signs, and warning lights as required.

F. Placing in hot weather: Comply with ACI 305R. Concrete shall be delivered, placed and finished in a sufficiently short period of time to avoid surface dry checking.

1. Concrete shall not exceed 85 degrees F at time of placement.
2. Concrete shall be kept wet continuously after tempering until implementation of curing compound procedure in accordance with this specification.
3. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 pounds per square foot per hour, before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

G. Placing in Cold Weather: Comply with ACI 306R. Protect from frost or freezing. No antifreeze admixtures are permitted.

1. When placing concrete during freezing or near-freezing weather, mix shall have temperature of at least 50 degrees F but not more than 90 degrees F.
2. Concrete shall be maintained at temperature of at least 50 degrees F for not less than 72 hours after placing or until it has thoroughly hardened.
3. Provide necessary thermal coverings for any flat work exposed to freezing temperatures.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Contractor shall comply with requirements applicable to this Section for concrete materials, admixtures, bonding materials, curing materials, surface sealers and others as required.

B. Concrete walking surfaces shall have a coefficient of friction not less than 0.30 and will be subject to testing to verify compliance as specified in Article FIELD QUALITY CONTROL.

1. The coefficient of friction will be measured by California Test 342 before pavement is opened to public traffic, but not sooner than 7 days after concrete placement.
2. Contractor shall notify the Architect and Project Inspector of pavement having a coefficient of friction less than 0.30.

C. Sustainable Design:

1. VOC emissions for field-applied adhesives, sealants, and sealant primers must comply with limits specified in Section 01 6116.
2. VOC emissions for field-applied paints and coatings must comply with limits specified in Section 01 6116.

2.2 FORMING MATERIALS

A. Form Material: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. The forms shall be of a depth equal to the depth of curbing or sidewalk, and so designed as to permit secure fastening together at the tops. Coat forms with non-staining type coating that will not discolor or deface surface of concrete.

1. Concrete Exposed to View: 5/8-inch minimum APA B-B Plyform, steel or “Sonotube” forms by Sunoco, 888-875-8754, or equal.
2. Concrete Concealed from View: 5/8-inch minimum APA B-B Plyform, steel or 1 x 8 DF, Number 2 Grade or better.

B. Form Ties: Snap off metal of fixed length, leaving no metal within 1-1/2 inches of surface and no fractures, spalls or other surface defects larger than 1 inch diameter; manufactured by Burke, Dayton Superior, or equal.

C. Spreaders: Metal. Wood is not permitted.

D. Form Coating: Coat forms with non-staining material that will not discolor or deface surface of concrete or leave any residue on concrete that would interfere with surface coating as approved by the Architect.

E. Chamfer Strips: Rigid polyvinyl chloride, 3/4-inch x 3/4-inch, in maximum possible lengths, manufactured by Burke, Greenstreak, Vulco, or equal.

2.3 REINFORCING MATERIALS

A. Reinforcement Bars: New billet steel deformed bars conforming to requirements of ASTM A615/A615M or ASTM A706/A706M; Grade 60.

1. Bars for dowels installed through expansion joints or construction joints to existing sidewalks or concrete features shall be smooth or if deformed shall be sleeved on one end for slippage.

B. Reinforcing Supports: Galvanized metal chairs or spacers or metal hangers, accurately placed 3 feet on center each way, staggered, with each support securely fastened to steel reinforcement in place.

1. Bottom bars in footings may be supported with 3-inch concrete blocks with embedded wire ties.
2. Concrete supports without wire ties will not be allowed.

2.4 CONCRETE MATERIALS

A. Cement: Portland cement in accordance with ASTM C150/C150M, Type II, low alkali.

B. Concrete Aggregates: Graded from coarse to fine in accordance with ASTM C33/C33M.

1. Normal Weight Aggregates: Clean and free from deleterious coatings, clay balls, roots, and other extraneous materials, and in conformance with ASTM C33/C33M, except as otherwise specified. Combined grading shall meet limits of ASTM C33/C33M.
   a. Size: Not be larger than one-fifth of the narrowest dimension between forms, or larger than three-fourths of the minimum clear spacing between reinforcing bars.
2. Lightweight Aggregates:
   a. General: Durable particles suitably processed, washed and screened without adherent coatings, free of materials with deleterious reactivity to alkali in cement, and conforming to ASTM C330/C330M.
   b. Fine aggregate shall be natural sand, or sand prepared from stone or gravel, with grains free of silt, loam and clay.

C. Water: Potable, clean, and in accordance with ASTM C94/C94M, free from injurious amounts of oil, acids, alkalis, salts, scale, organic materials or other deleterious matter, and in compliance with ACI 318 Section 26.4.1.3.

D. Fly Ash: Western Fly Ash, conforming to ASTM C618 for Class N or Class F materials and in accordance with CBC Section 1903A.6.

1. Class C is not permitted.
2. Proportions: Not more than 15 percent (by weight) may be substituted for portland cement.

2.5 ADMIXTURES

A. Water Reducing Admixture: Admixture to improve placing, reduce water cement ratio and ultimate shrinkage; “WRDA 64” by GCP Applied Technologies, or equal conforming to ASTM C494/C494M and ACI 318 Section 3.6.

1. Water reducing admixture may be used subject to prior approval by the Architect, Engineer, and the Testing Lab.
2. Proposed product and quantity shall be included in original design mix.

B. Air-Entraining Admixture: “Daravair 1000” by GCP Applied Technologies or equal conforming to ASTM C260 and ACI 318, section 26.4.1.4.

1. Proportion air entraining concrete to attain specified minimum 28-day compressive strength.
2. Total air entrainment in concrete shall be not less than 4 percent or more than 6 percent of the volume of concrete.

C. Glare Reduction Colorant: Concentrated pigment dispersions designed to permanently color concrete; “Chromix L10 Base-Black” by Sika Corporation, or equal. *Was within 2.2 H.1*

D. Coloring Agent for Integrally Colored Concrete: Weather resistant, UV stable, lightfast, and alkali resistant free-flowing concentrated pigment granules designed to permanently color concrete; Scofield “Chromix G” (granular) / “Chromix L” (liquid) by Sika Corporation, or equal.

1. Colors: As selected by Architect from manufacturer’s full range of standard colors.

2.6 CURING MATERIALS

A. Clear Curing Compound: Water-based membrane-forming concrete curing compound in accordance with ASTM C309 and C1315; “Aqua Resin Cure Clear” by Burke CO, “1100” by W.R. Meadows, or equal.

B. Colored Curing Compound: Scofield “Lithrochrome Colorwax Concrete Curing Compound” by Sika Corporation or equal meeting ASTM C309 for liquid membrane curing compounds.

1. Color: To match selected coloring agent additive.

2.7 SURFACE TREATMENTS

A. Surface Retarder for Exposed Aggregate Finish: “Rugasol-S” by Sika Corporation, “Top-Cast” by GCP Applied Technologies, or equal.

B. Concrete Stain: High performance, low-odor, reactive polymer; Scofield “Lithochrome Tintura Stain” by Sika Corporation, or equal.

1. Colors: As selected by Architect.

C. Heavy Duty Color Hardener: Heavy duty abrasion resistant dry shake color hardener comprised of specialty aggregates; Scofield "Emerchrome SC Color Hardener” by Sika Corporation, or equal.

1. Colors as selected by Architect.

D. Sealer for Stained Concrete: High-solids, low-odor, self-crosslinking, abrasion resistant, urethane fortified acrylic; Scofield “SelectSeal Plus: by Sika Corporation, or equal.

1. Colors: To be selected by Architect from standard colors.

2.8 ADDITIONAL MATERIALS AND COMPONENTS

A. Concrete Bonding Agent: The following, or equal, conforming to ASTM C1059/C1059M.

1. “Weld-Crete” by Larson Products Corporation, 800-633-6668.

2. “Daraweld C” by GCP Applied Technologies, 877-423-6491.

B. Patching Mortar: One-component, trowel applied, migrating-corrosion-inhibitor enhanced, polymer-modified, shrinkage-compensated, fiber reinforced, micro-silica enhanced, cementitious repair mortar for horizontal, vertical, and overhead applications; “Meadow-Crete GPS” by W.R. Meadows, or equal.

C. Non-Shrink Grout: Premixed, non-metallic, no chlorides, non-staining and non-shrinking conforming to ASTM C1107/C1107M; “MasterFlow 713” by Master Builders Solutions, a division of BASF, 800-433-9517, or equal.

D. Drainage Rock Base: 3/4-inch aggregate size conforming to Class 2 Aggregate Base as defined in Caltrans Standard Specifications Section 26, or equal clean free-draining gravel or crushed rock as recommended by the Geotechnical Engineer.

E. Expansion Joint Material: Preformed 3/8-inch fiber material, with bituminous binder manufactured for use as concrete expansion joint material and conforming to ASTM D1751 and approved by Architect.

1. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint-filler sections together.

F. Joint Sealant for Expansion Joints in Concrete: Weather and UV resistant, single component, cold applied silicone sealant, Type S, conforming to ASTM D5893/D5893M; ASTM C920, Grade P, Class 25, Use T.

1. Self-Leveling: “DOWSIL 890-SL Silicone Joint Sealant” by Dow Chemical Company, or equal.
2. At Slopes Exceeding 5 Percent: Non-sagging; “DOWSIL 888 Silicone Joint Sealant” by Dow Chemical Company, or equal.
3. Color: As standard with manufacturer.

G. Pre-Formed Plastic Expansion Joint Caps: Polystyrene, with removable tops; “Snap Cap” by W. R. Meadows, Tex-Trude expansion caps, or equal.

H. Truncated Domes: Vitrified Polymer Composite (VPC) cast-in-place detectable/tactile warning surface tiles complying with Americans with Disabilities Act (ADA) and the California Code of Regulations (CCR) Title 24, Part 2, Chapter 11B; “Armor-Tile”, “Access Tile Tactile Systems,” or equal.

1. Color: Shall be yellow and approximate 33538 of GSA/SAE AMS-STD-595A in accordance with CBC Section 11B-705.1.1.3.1.

I. Traffic Paint for Accessibility Striping at Stairs: VOC compliant, water-based, vinyl acrylic copolymer fast drying emulsion and specifically formulated as a traffic marking paint; “Setfast” with “Duckback” abrasive additive by Sherwin-Williams, “SAFE-STRIDE” by Wooster Products, Inc., or equal.

1. Colors: As selected by Architect.[Yellow]

2.9 CONCRETE DESIGN AND CLASS

A. Designed Strength and Classes of Concrete: The following mixes are not applicable to concrete items exceeding 4 feet in height above the adjacent grade.

1. Class “B”: Concrete shall have 1 inch maximum size aggregate, shall have 3000 pounds per square inch minimum at 28 day strength with a maximum water to cementitious ratio no greater than 0.50.
    a. Location of Use: Exterior slabs, including walks, vehicular paved surfaces, manhole bases, poured-in-place drop inlets, curbs, valley gutters, curb and gutter, and other concrete of like nature.
2. Class "D" concrete of 1 inch maximum size aggregate shall have 3500 pounds per square inch 28 day strength with a maximum water to cementitious materials ratio of 0.55.
    a. Location of Use: Footings and retaining walls not attached to buildings, and planter walls, monument signs, and other site concrete not described for use in Class “B”.

B. Slump Limits: Provide concrete, at point of final discharge of proper consistency as tested in accordance with ASTM C143/C143M with slumps of 4 inches, plus or minus 1 inch.

C. Mix Design: Concrete shall be designed for strength in accordance with provisions of CBC Section 1905A.

1. Should the Contractor desire to pump concrete, a modified mix design will need to be submitted for review.
2. Fly ash may be used in concrete to improve workability in amounts up to 15 percent of the total cementitious weight.

D. Air Entrainment: Provide at concrete paving / flatwork, including concrete ramps and stairs in accordance with local jurisdiction minimum requirements, but no less than 3 percent of the volume of concrete.

E. Glare Reduction Additive:

1. General:
    a. Provide at exterior concrete slabs, walks, ramps, stairs, including bleachers, and other exposed flatwork to eliminate glare.
    b. Omit glare reduction colorant where color hardener, integral color, and stain treatment of concrete are scheduled.
2. Quantity: As required to match approved sample but not exceed 2 pounds of colorant per cubic yard of concrete.
3. Add colorant to mix in accordance with manufacturer's printed instructions.

F. Coloring Agent:

1. Quantity: Add pigment as required to result in hardened concrete color consistent with approved sample but not exceeding maximum dosage per sack of cement as recommended by manufacturer based on total cementitious materials of mix design.

2. Add pre-mixed colorant bags to mix in accordance with manufacturer's printed instructions.

2.10 MIXING OF CONCRETE

A. Conform to requirements of CBC Chapter 19A.

B. Concrete shall be mixed until there is uniform distribution of material and mass is uniform and homogenous; mixer must be discharged completely before the mixer is recharged.

C. Concrete shall be Ready-Mixed Concrete: Mix and deliver in accordance with the requirements set forth in ASTM C94/C94M and ACI 301. Batch Plant inspection may be waived in accordance with CBC Section 1705A.3.3, when approved by the Project Engineer and DSA.

1. Furnish batch certificates for each batch discharged and used in the work.
2. Approved Testing Laboratory shall check the first batching at the start of the work and furnish mix proportions to the Licensed Weighmaster.
3. Licensed Weighmaster shall identify materials as to quantity and to certify to each load by ticket.
4. Delivery tickets are to accompany each truck and shall be kept in the job superintendent's file. Delivery tickets must indicate the following information or be subject to rejection:
    a. Name of Project.
    b. Supplier of concrete.
    c. Truck identity and ticket serial number.
    d. Date of delivery.
    e. Brand of cement.
    f. Cement content.
    g. Strength classification.
    h. Batching time.
    i. Point of deposit.
    j. Total amount of water.
    k. Weight of aggregate.
    l. Daily temperature.
    m. Number of cubic yards in load.
    n. Admixture content.
    o. Name of Contractor.
    p. Name of driver.
    q. Time loaded and first mixing of concrete.
    r. Reading of revolution counter.
    s. Color additive.
5. Ticket shall be transmitted to Project Inspector by truck driver with load identified thereon. Project Inspector will not accept load without load ticket identifying mix and will keep daily record of pours, identifying each truck, its load and time of receipt, and will transmit two copies of record to DSA.

6. At end of project, Weighmaster shall furnish affidavit to DSA on form satisfactory to DSA, certifying that all concrete furnished is in conformance with proportions established by mix designs.
7. Placement of concrete shall occur as rapidly as possible after batching and in a manner which will assure that the required quality of the concrete is maintained. In no case may concrete be placed more than 90 minutes from batch time.
    a. When air temperature is between 85 and 90 degrees F, reduce maximum batching to discharge time from 90 minutes to 75 minutes.
    b. When air temperature is above 90 degrees F, reduce maximum batching to discharge time to 60 minutes.
8. Water may be added to the mix only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded.
    a. The quantity of water used for each batch shall be accurately measured.
    b. In no case shall more than 10 gallons of water be added to a full 9-yard load, or 1 gallon per yard on remaining concrete within the drum, providing load tag indicates at time of mixing at plant an allowance for additional water.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Confirm general layout, grade, and joint pattern layout with the Architect prior to placing concrete.

B. Verify that gradients and elevations of the base are correct, and that the base is dry.

C. Contractor shall report in writing to the Architect prevailing conditions that will adversely affect satisfactory execution of the work of this Section.

1. Do not proceed with work until unsatisfactory conditions have been corrected.

D. Forms and reinforcements are subject to approval by the Project Inspector as specified in Article FIELD QUALITY CONTROL.

3.2 PREPARATION

A. Remove frost, water, and other foreign materials from form surfaces, reinforcement, and embedded items against which concrete will be placed.

B. When the ambient temperature necessitates the use of cold or hot weather concreting, make provisions in advance of concrete placement.

C. Before placing concrete, clean tools and equipment, and remove debris from areas to receive concrete.

D. Clean reinforcing and other embedded items of coatings, oil, mud and soil that may impair bond with concrete.

E. Slab-On-Grade: After subgrade has been approved by Geotechnical Engineer, install specified drainage rock base material to thickness shown. Rock base shall be implemented and compacted in accordance with the Geotechnical Report and recommendations of the Geotechnical Engineer.

3.3 INSTALLATION – FORMWORK

A. Form material shall be straight, true, sound and able to withstand deformation due to loading and effects of moist curing. Materials which have warped or delaminated, or require more than minor patching of contact surfaces, shall not be reused.

B. Build forms to shapes, lines, grades and dimensions indicated. Construct formwork to maintain tolerances required by ACI 301. Forms shall be substantial, tight to prevent leakage of concrete, and properly braced and tied together to maintain position and shape. Butt joints tightly and locate on solid backing. Chamfer corners where indicated. Form bevels, grooves and recesses to neat, straight lines. Construct forms for easy removal without hammering, wedging or prying against concrete.

C. Space clamps, ties, hangers and other form accessories so that working capacities are not exceeded by loads imposed from concrete or concreting operations.

D. Build openings into vertical forms at regular intervals if necessary to facilitate concrete placement, and at bottoms of forms to permit cleaning and inspection.

E. Build in securely braced temporary bulkheads, keyed as required, at planned locations of construction joints.

F. Before placement of reinforcing steel, coat faces of all forms to prevent absorption of moisture from concrete and to facilitate removal of forms. Apply specified material in conformance with manufacturer's written directions.

1. Seal all cut edges.
2. Before re-using form material, inspect, clean thoroughly, and recoat.

G. Slope tie-wires downward to outside of wall.

H. Brace, anchor and support all cast-in items to prevent displacement or distortion.

I. During and immediately after concrete placing, tighten forms, posts and shores. Readjust to maintain grades, levels and camber.

J. Concrete Paving, Curbs, Curb and Gutters, Ramps:

1. Expansion Joints: Install at locations indicated, and so that maximum distance between joints is 20 feet for exterior concrete unless otherwise shown. Expansion joint material shall be full depth of concrete section. Recess for snap cap and sealant when required.
2. Curbs, Valley Gutter, and Curb & Gutter: Install expansion joints at 60 feet on center, except when placing adjacent to concrete walks, the expansion joints shall align with the expansion joints shown for the concrete walks. Expansion joint material shall be full depth of concrete section. Recess for snap cap and sealant when required.
3. Isolation Joints: 3/8-inch felt between walls and exterior slabs or walks so that paved areas are isolated from all vertical features, unless specifically noted otherwise on plans.
4. Exterior Concrete Paving: Install expansion joints at 20 feet on center maximum, both directions, unless shown otherwise on plans.

5. Ramps: Whether shown or not, all ramps shall have control joints and expansion joints.
    a. Control joints on ramps shall be aligned and placed in between the vertical posts for the handrails. The curbs, if required shall have control joints that align with the handrail posts.
    b. Expansion joints shall be placed at the upper, intermediate, and bottom landings.

K. Inspection: Refer to Article FIELD QUALITY CONTROL.

3.4 INSTALLATION – REINFORCING

A. General: Reinforcing shall be accurately placed at locations indicated on the drawings within required tolerances and providing required clearances. Reinforcement shall be secured prior to placement of concrete such that tolerances and clearances are maintained. Coverage shall be in accordance with Section 1907A.7 of the CBC.

1. Reinforcement must be in place before concreting is begun.
2. Keep a person on the job to maintain position of reinforcing as concrete is placed.
3. All expansion and construction joints in concrete shall have dowels of size and spacing as shown on the Drawings, or as approved by Architect.
4. Give notice whenever pipes, conduits, sleeves, and other construction interferes with placement; obtain method of procedure to resolve interferences.

B. Additional reinforcing steel shall be placed around all utility boxes, valve boxes, manhole frames and covers that are located within the concrete placements.

1. The bars shall be placed so that there will be a minimum of 1-1/2-inch clearance and a maximum of 3-inch clearance. The reinforcing steel shall be placed mid-depth of concrete slab.

C. At right angles or intersections of concrete walks, additional 2 feet x 2 feet #5, 90 degree bars shall be added at all inside corners for additional crack control. The bars shall be placed 2 inches from concrete forms and supports, at mid-depth of slab.

D. Reinforcing steel shall be adequately supported by approved devices on centers close enough to prevent any sagging.

E. Placing Tolerances:

1. In accordance with ACI 301 or CRSI/WCRSI Recommended Practice for Placing Reinforcing Bars, unless otherwise shown.
2. Clear distance between parallel bars in a layer shall be no less than 1 inch, the maximum bar diameter shall not exceed 1-1/2 times the maximum size of coarse aggregate.

F. Splices:

1. General: Unless otherwise shown on drawings, splice top reinforcing at midspan between supports, splice bottom reinforcing at supports, and stagger splices. Bar laps shall be wired together. Reinforcing steel laps shall be as follows:
    a. Length of Lap Splices in Concrete:

1) No. 4 bar: 24 inches minimum.
2) No. 5 Bar: Not less than 62 bar diameters.
3) No. 6 Bar: 56 inches minimum.
4) No. 7 Bars and Larger: Not less than 93 bar diameters.

b. All splices shall be staggered at 5 feet minimum from adjacent splices.

G. Inspection: Refer to Article FIELD QUALITY CONTROL.

3.5 PLACING OF CONCRETE – GENERAL

A. Adjacent finish surfaces shall be protected at all times during the concrete pour and finishing. Verify that all formwork is tight and leak-proof before concrete is poured. Finish work defaced during the concrete pour and finishing shall be replaced at no extra cost to Owner.

B. Remove wood chips, sawdust, dirt, loose concrete and other debris just before concrete is to be poured. Use compressed air for inaccessible areas. Remove all standing water from excavations.

C. Transport concrete from mixer to place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients. Deposit as close as practicable in final position to avoid re-handling or flowing. Partially hardened concrete must not be deposited in work. Concrete shall not be wheeled directly on top of reinforcing steel.

D. Keep excavations free of standing water, but moisture condition sub-grade before concrete placement.

E. Placing: Once started, continue concrete pour continuously until section is complete between predetermined construction joints. Prevent splashing of concrete onto adjacent forms or reinforcement and remove such accumulation of hardened or partially hardened concrete from forms or reinforcement before work proceeds in that area. Free fall of concrete shall not to exceed 4'-0" in height. If necessary, provide lower openings in forms to inject concrete and to reduce fall height.

F. Remove form spreaders as placing of concrete progresses.

G. Place footings as monolithic and in one continuous pour.

H. Compacting: Concrete shall be compacted by mechanical vibrators.

1. Concrete shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.
2. Vibrating shall not be applied to concrete which has already begun to initially set or be continued so long as to cause segregation of materials.

3.6 REMOVAL OF FORMS

A. Remove without damage to concrete surfaces.

1. Sequence and timing of form removal shall insure complete safety of concrete structure.

2. Forms shall remain in place for not less than the following periods of time. These periods represent cumulative number of days during which temperature of air in contact with concrete is 60 degrees F and above.
    a. Vertical Forms of Foundations, Walls and All Other Forms Not Covered Below: 5 days.
    b. Concrete Paving Edge Screeds or Forms: 7 days.
3. Concrete shall not be subjected to superimposed loads (structure or construction equipment) until it has attained its full design strength and not for a period of at least 21 days after placing. Concrete systems shall not be subjected to construction loads in excess of design loads.

B. Patching: Install specified patching mortar per manufacturer's recommendations. Repairs to defective concrete which affect the strength of any structural concrete member or component are subject to approval by the architect and DSA.

3.7 CONCRETE PAVING

A. Concrete paving shall be formed and finished to required line and grades true and flat with a maximum tolerance of 1/8-inch in 10 feet for flatness and to slopes indicated.

B. Concrete vibrator shall be used to assist concrete placement. Contractor shall have spare concrete vibrator on site during concrete placement.

C. Thoroughly water and soak the subgrade of exterior concrete paving, curbs, curb and gutters, with multiple daily waterings for at least three days or as required to achieve required moisture content prior to the concrete pour in order to place the subgrade soils in full expansion.

1. Provide damming as required to keep standing water within the formed area and to allow for proper saturation and full expansion of the subgrade soils.
2. Remove standing water before concrete placement.

D. Construction Joints:

1. Keep exposed concrete face of construction joints continuously moist from time of initial set until placing of concrete; thoroughly clean contact surface by chipping entire surface not earlier than 5 days after initial pour to expose clean hard aggregate solidly embedded, or by approved method that will assure equal bond, such as green cutting.
2. If contact surface becomes contaminated with soil, sawdust or other foreign matter, clean entire surface and re-chip entire surface to assure proper adhesion.

3.8 INTEGRALLY COLORED CONCRETE

A. Maintaining consistent color in integrally colored concrete is required.

1. The Contractor shall coordinate with its concrete producer to review color additive manufacturer's recommendations for best practices to be followed including necessary crew size, tools, and batch-to-batch color consistency.
2. No water is to be added while the ready-mix truck is in transit and no clean-out water is to be left in trucks which may result in change in color.

3. The same type and brand of cement, sand and aggregates shall be used in each batch of concrete.

B. Mix Design: Additives and accelerator, if required, that contain calcium chloride are not permitted.

C. Curing shall be performed with color-matched curing compound.

D. Follow additional requirements used to prepare the approved site mockup.

3.9 FINISHING

A. Concrete Paving: Finish surface as required by ACI 302.1R using manual and vibrating screeds to place concrete level and smooth.

1. Under no circumstances shall water be added to the top surface of freshly placed concrete.
2. Use “jitterbugs” or other special tools designed for the purpose of forcing the course aggregate below the surface leaving a thick layer of mortar 1 inch in thickness.
3. After tamping the concrete, wood float surface to a true and even plane.
4. After floating with a wood bull float, make 2 passes with a steel Fresno trowel to start sealing the concrete surface.
5. While concrete is still wet but sufficiently hardened to bear a persons’ weight on knee boards, start troweling with a steel hand trowel or a machine trowel in larger areas. Use sufficient pressure to bring moisture to surface.
6. After surface moisture has disappeared, finish concrete utilizing steel, hand or power trowel.
7. Completed surface shall be free from trowel marks, depressions, ridges or other blemishes. Tolerance for flatness shall be 1/8-inch in 10 feet.
8. Provide final finish as follows, unless otherwise indicated:
    a. Medium Broom Finish: Typical finish to be used at all exterior walks, stairs and ramps. Brooming direction shall run perpendicular to slope to form non-slip surface.

B. Curb Finish: Steel trowel.

C. Joints and Edges:

1. Mark-off exposed joints, where indicated, with 1/4-inch radius x 1 inch deep jointer or edging tool. Joints shall be clean, cut straight and parallel or square with respect to concrete walk edge.
2. Tool edges of control joints, walk edges, and wherever concrete walk adjoins other material or vertical surfaces. Expansion joints shall be constructed as detailed on plans.
3. The expansion joints shall be full depth as shown in the Drawings. Failure to do so will result in non-compliance and shall be immediately machine cut by the Contractor at its expense.

D. Exposed Concrete Surface Finishing, Not Including Top Surface of Flatwork:

1. Remove fins and rough spots immediately following removal of forms from concrete which is to be left exposed. Damaged and irregular surfaces and holes left by form clamps and sleeves shall be patched with grout.
2. Tie wires are to be removed to below exposed surface and holes pointed up with neat cement paste similar to procedure noted under "After patching" in subparagraph below.
    a. Removal of tie wires shall extend to distance of 2 inches below established grade lines.
    b. Ends of tie wires shall be cut off flush at other, unexposed locations.
    c. Care shall be taken during pointing to match adjacent finishes of exposed concrete surface.
3. After patching, concrete that is to remain exposed shall be sacked with a grout mixture of 1-part cement, 1-1/2-parts fine sand and sufficient water to produce a consistency of thick paint.
    a. After first wetting the concrete surface, apply mixture with a brush and immediately float entire surface vigorously using a wood float. Keep damp during periods of hot weather.
    b. When set, excess grout shall be scraped from wall with edge of steel trowel, allowed to set for a time, then wiped or rubbed with dry burlap.
    c. Entire finishing operation of an area shall be completed on the same day. This treatment shall be carried to 4 inches below grade, and all patching and sacking shall be done immediately upon removal of the forms.

E. Stair Treads and Risers: Tool exterior stair tread and landing nosings to comply with ADA and CBC accessibility requirements and as detailed.

1. Nosings shall contain no pockets, voids or spalls. Patching is not allowed. Damaged nosings shall be replaced.
2. Provide a contrasting striping consisting of Painted grooves at leading edge area of every tread and landing in compliance with CBC Section 11B-504.4.1.

3.10 APPLICATION OF COLOR HARDENER

A. General:

1. Comply with approved manufacturer’s application instructions summarized in this Article.
2. Protect adjacent paving and planting areas during the coloration process.

B. Coordinate mix design and finishing of concrete with application requirements for color hardener.

1. Concrete mix itself must have enough water to bleed to the surface when placed but with water completely absorbed when the concrete reaches its initial set.
2. Apply product when a thumbprint can still indent the surface, and kneeboards and application of the hardener will not alter flatness.
3. Do not apply while bleed water is still rising or a layer of water may become trapped beneath the surface.

C. Rate: As recommended by manufacturer for respective service environment and selected color.

D. Apply color hardener evenly to wet plastic surface by dry-shake method.

1. Apply 1/2 of the desired dose of hardener across the surface of the concrete using an underhand or side arm motion taking care to ensure even distribution.
2. Hand or power float the hardener into the concrete surface then broadcast the remaining material from a different direction than the first to eliminate bare spots.
3. Heavy doses to meet approved appearance may require three broadcast and float cycles.
4. Floating must be thorough and complete so all hardener is wet-out, and completely worked into and bonded with the partially set concrete.

E. Complete final finishing with hand or machine trowels. Do not wet tools or color alteration will result. Avoid overuse of hard steel tools that may burnish the surface and alter color.

F. Apply a coat of curing compound after final finish to prevent cracking due to premature surface drying and shrinkage. Curing compound shall be clear or color matched to comply with method used on approved mockup.

3.11 APPLICATION OF SURFACE RETARDER FOR EXPOSED AGGREGATE FINISH

A. General: Comply with approved manufacturer's application and removal instructions summarized in this Article.

B. Shake product container well before application.

C. Apply uniformly to the wet concrete after the initial bleed water rises to the surface.

D. Spray with a low-pressure sprayer until the surface has a complete hiding coat. Do not apply too sparingly.

1. Use water for clean-up.
2. Allow 1-2 hours to dry.

E. For removal, wash away the retarded cement matrix the next day, using high-pressure water unless mix design, use of lightest etch, and ambient temperatures deem it necessary to remove the retarded matrix the same day to achieve appearance of approved mockup.

1. Exercise care, and install protective procedures, to prevent rinse water from damaging adjacent materials or entering adjacent soil and planting areas.
2. Should rinse water contaminate soil of planting areas, affected soil shall be removed and replaced with new soil at no additional cost to Owner

3.12 CURING

A. Formed Concrete:

1. Keep forms and top on concrete between forms continuously wet until removal of forms, 7 days minimum.

2. Maintain exposed concrete in a continuous wet condition for 14 days following removal of forms.

B. Concrete Paving, Curb, Curb and Gutter, Valley Gutter:

1. Cure utilizing curing compound. If applicable, the Contractor shall verify that the approved curing compound is compatible with the approved colorant system.
2. Curing compound shall be applied in a wet puddling application. Spotty applications shall be reason for rejection and possibly concrete removal and replacement at the contractor's expense with no compensation from the Owner.

C. No curing compound shall be applied to areas scheduled to receive resilient track surface including, curbs, ramps, runways, and similar items.

3.13 DEFECTIVE CONCRETE

A. General:

1. Determination of defective concrete shall be made by the Architect or Engineer whose opinion shall be final in identifying areas to be replaced, repaired or patched.
2. As directed by Architect, cut out and replace defective concrete.
   a. Defective concrete shall be removed from the site.
   b. No patching is to be done until surfaces have been examined by Architect and permission to begin patching has been provided.
   c. Permission to patch an area shall not be considered waiver of right by the Owner to require removal of defective work, if patching does not, in opinion of Architect, satisfactorily restore quality and appearance of surface.
   d. Remove and replace concrete if repair to an acceptable condition is not feasible.

B. Defective Concrete Is:

1. Concrete that does not match the approved mix design for the given installation type.
2. Concrete not meeting specified 28-day strength.
3. Concrete which contains rock pockets, voids, spalls, transverse cracks, exposed reinforcing, or other such defects which adversely affect strength, durability or appearance.
4. Concrete which is incorrectly formed, out of alignment or not plumb or level, or outside of the maximum tolerance for flatness and slopes indicated.
5. Concrete containing embedded wood or debris.
6. Concrete having large or excessive patched voids which were not completed under Architect's direction.
7. Concrete not containing required embedded items.
8. Concrete with excessive shrinkage, transverse cracking, crazing, curling; or defective finish.
9. Concrete that is unsuitable for placement or has set in truck drum for longer than 90 minutes from the time it was batched.

10. Concrete where expansion joint filler that is not isolating the full depth of the concrete section, and not recessed as required for backer rod and sealant where required.
11. Concrete that is excessively wet or excessively dry and will not meet the minimum or maximum slump required per mix design.
12. Finished concrete with oil stains from equipment use, and or rust spots that cannot be removed.
13. Concrete with control joints (weakened planed joints) that do not meet the required minimum depth shown on the drawings.
14. Concrete not meeting slip-resistance requirements.

C. Flatwork: The Owner reserves the right to survey the flatwork, to determine if flatwork is outside of the maximum tolerance for flatness and slopes as indicated.

1. If the flatwork is found to be out of tolerance, then the Contractor is required to replace concrete at no additional expense to the Owner.
2. Determination of flatwork flatness, surveying and remedial work must be completed far enough in advance so that the project schedule is maintained, delays are avoided, and the new flatwork or flatwork repairs are properly cured.
3. The Contractor will be responsible for reimbursing the Owner for costs associated with re-surveying to verify compliance of work remediated by the Contractor.

3.14 STAINING CONCRETE FLATWORK

A. Surface Preparation Prior to Staining and Sealing:

1. Allow concrete to cure prior to application of stain or sealer.
2. Surfaces shall be cleaned and free of dust, joint treatment droppings, grease, oil, and other foreign matter which would prevent necessary penetration and subsequent reaction of the stain solution with concrete surface.
3. Comply with stain and sealer manufacturer's recommendations for methods to be used for cleaning each type of contaminant.
4. Test for moisture content to ensure that surface is sufficiently dry.

B. Curing:

1. Concrete to receive stain shall be cured with new and unwrinkled, nonstaining curing paper. Do not use curing compounds. Do not overlap paper.
2. Allow to cure in accordance with recommendations of stain manufacturer prior to application of stain. Curing time may vary based on selected colors.
3. If required to achieve selected color, cure concrete with specified colored curing compound in lieu of curing paper.

C. Preparation After Curing:

1. Surfaces shall be cleaned and free of dark alkali spots, grease, oil, soap, and other foreign matter which would prevent necessary penetration and subsequent reaction of the stain solution with concrete surface to be stained.
2. Comply with stain manufacturer's recommendations for methods to be used for cleaning each type of contaminant. Cleaning methods shall include pressure washing of non-flatwork and rotary machine cleaners for flatwork as required.

D. Application of Stain:

1. Apply in accordance with the manufacturer's instructions. Apply in two coats, unless only one coat is required over color hardener to achieve selected color.
2. Verify manufacturer's recommended drying time between coats.
3. After second coat of stain has dried, remove residue salts from surface by wet scrubbing with a stiff brush and flushing with clean water until rinse water runs clear. Protect surrounding areas and construction from damage by runoff.
4. Provide traffic barriers to recirculate construction traffic. Surfaces shall be allowed to dry without covering.

E. Stained slab shall be allowed to dry completely and shall be tested for dryness acceptable to sealer manufacturer prior to application of sealer. Do not proceed until concrete meets dryness requirements.

F. Final Sealer:

1. Use either clear or colored sealer as required to achieve accepted colors. Apply two coats of sealer to properly dried stain coats in accordance with manufacturer's instructions. Sealer shall be spray applied and rolled.
2. Follow manufacturer's recommended time between coats.
3. Provide dust control in area of concrete toppings for the first 48 hours after application of sealer. No carpentry or gypsum board work shall be done during this period.
4. Verify with sealer manufacturer the use of Kraft paper covering of sealer as the work progresses. Protective covering shall be applied only after manufacturer recommends product "off-gassing" is finalized. Premature covering may contribute to a finish that looks "cloudy."
5. Heavy equipment, scaffolding, or other activity which may damage surface shall not be allowed on the surface until sealer is fully cured.

3.15 INSTALLATION OF TRUNCATED DOMES

A. General:

1. Comply with manufacturer’s installation instructions as summarized in the Article.
2. Verify concrete to receive embedded truncated dome tiles is within the slump range recommended by tile manufacturer to permit placement without mix causing tiles to float.
3. Maintain factory-installed plastic sheeting during installation process to prevent splashing of concrete onto the finished surface of the tile.
4. If necessary to ensure that adjacent tiles are flush to each other during the installation process, bolt tiles together using 1/4 inch or equivalent hardware or other methods recommended by tile manufacturer.

B. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the tile placement. Immediately after finishing concrete, the electronic level should be used to check that the required slope is achieved.

C. Installing Tiles:

1. Install tiles into fresh concrete using techniques that will eliminate air voids under the tile.
    a. Holes in the tile perimeter allow air to escape during the installation process.
    b. Allow concrete to flow through holes in embedment flanges on underside of tile to lock tile solidly into the cured concrete.
2. Tiles shall be placed true and square.
3. Tiles shall be tamped or vibrated into the fresh concrete to ensure that the field level of the tile is flush to the adjacent concrete surface to permit proper water drainage and eliminate tripping hazards between adjacent finishes.

D. Immediately after placement, the tile elevation shall be checked with the elevation and slope permitting water drainage, to ensure that the field surface of the tile is flush with the surrounding concrete, and that no ponding is possible on the tile.

E. While concrete is still workable, a 3/8 inch radius edging tool shall be used to create a finished edge of concrete, then a steel trowel shall be used to finish the concrete around the tile's perimeter, flush to the field level of the tile.

F. If necessary, adjust tile before the concrete sets. Use two suitable weights of 25 pounds each if necessary to ensure solid contact of the underside of tile to concrete.

G. During and after the tile installation and the concrete curing stage, prohibit walking, leaning, or placing of other external forces on tile that may rock the tile causing a void between the underside of tile and concrete.

H. After concrete is cured, remove factory-applied protective plastic wrap and concrete that may have bled under the plastic following procedures recommended by the tile manufacturer.

I. Protect tiles after installation and during remainder of construction period.

J. Prior to Owner acceptance, clean tiles complying with manufacturer's procedures for cleaning of tile surface.

3.16 SEALANT

A. Apply sealant in compliance with manufacturer's instructions, using hand guns or pressure equipment with proper nozzle size, on clean, dry, properly prepared substrates.

B. Force sealants into joint against sides of joint to make uniform. Avoid pulling of the sealant from the sides. Fill sealant space completely with sealant.

C. Finished joints shall be straight, uniform, smooth, and neatly finished.

D. Remove any excess sealant from adjacent surfaces of joints utilizing the manufacturer's recommended solvent and cleaning processes. Leave the work in a neat, clean condition.

3.17 FIELD QUALITY CONTROL

A. Inspection of Forms and Reinforcing:

1. Approval of forms and reinforcing steel must be received from Project Inspector prior to pouring concrete.
2. Notice of readiness to place first pour shall be given to Project Inspector, DSA, Architect, and Engineer not less than 48 hours prior to placement of concrete to allow for inspection.
3. Pouring of concrete shall not proceed prior to completing requested adjustments to forms and reinforcing and without approval of Project Inspector.

B. Testing of Concrete:

1. Frequency and Samples for Testing:
   a. Four identical cylinder samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, or not less than once for each 50 cubic yards of concrete, or not less than once for each 2,000 square feet of surface area for slabs or walls.
   b. In addition, samples for strength tests for each class of concrete shall be taken for seven-day tests at the beginning of the concrete work or whenever the mix or aggregate is changed.
2. Testing:
   a. Slump: Each truck's concrete shall be tested for slump before concrete is placed.
   b. Strength:
      1) Tests for strength will be conducted by Testing Agency on one cylinder at 7 days and two cylinders at 28 days. The fourth remaining cylinder will be available for testing at 56 days if the 28-day cylinder test results do not meet the required design strength.
      2) On a given project, if the total volume of concrete is such that the frequency of specified testing would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.

C. Slip-Resistance Testing: Owner's Testing Agency will perform testing on flatwork to verify compliance with specified slip-resistance.

1. The coefficient of friction will be measured by California Test 342 before pavement is opened to public traffic, but not sooner than 7 days after concrete placement
2. Where paving is determined to have a coefficient of friction less than 0.30, Contractor is to repair and/or replace these surfaces at no cost to Owner.

3.18 CLEANING

A. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.

B. Clean excess material from surface of all concrete walks and utility structures.

C. Power wash concrete surfaces to remove stains, dried mud, tire marks, and rust spots.

D. Comply with any additional requirements of additive manufacturer for colored concrete.

3.19 PROTECTION

A. Graffiti-resistant Coating:

1. Surface Preparation: Prepare concrete surface to receive graffiti-resistant coating specified in Section 09 9623, Graffiti-Resistant Coatings, where indicated.
2. Concrete must be clean, dry, and free of effloresence and dust.

B. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

C. In the event of damage during construction, make all repairs and replacements necessary to the approval of the Architect, at no additional cost to the Owner.

END OF SECTION

SECTION 32 31 19

FENCES AND GATES - ORNAMENTAL METAL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes
1. Ornamental Metal Fencing
2. Manually operated, swing gates
3. Rough and finish hardware, fasteners, and related accessories

1.02 REFERENCE STANDARDS

A. Conform to current adopted reference standards by date of issue of the current code cycle and the date of the Contract Documents.

B. American Society for Testing and Materials (ASTM)
1. ASTM A36 - Carbon Structural Steel
2. ASTM A123 - Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products
3. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
4. ASTM A513 - Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
5. ASTM A641 - Standard Specifications for Zinc-Coated (Galvanized) Carbon Steel Wire
6. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
7. ASTM A568/A568M - General Requirements for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.
8. ASTM B117 - Test Method of Salt Spray (Fog) Testing
9. ASTM B221-Standard Specification for Aluminum and Aluminum – Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
10. ASTM C1107 - Packaged Dry, Hydraulic - Cement Grout (Non-Shrink)
11. ASTM D2247 - Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
12. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
13. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test

C. American Welding Society (AWS)
1. AWS D1.1 - Structural Welding Code, Steel
2. AWS A5.1 - Carbon Steel Electrodes for Shielded Metal Arc Welding
3. AWS 5.5 - Low Alloy Steel Covered Arc Welding Electrodes.

D. American Institute of Steel Construction (AISC)
1. AISC Specifications - Manual of Steel Construction

E. 2016 California Building Code (CBC)

1. CBC 10 - Chapter 10, Egress Requirements
2. CBC 11 - Chapter 11, Accessibility
3. CBC 19A - Chapter 19A, Concrete

1.03 SUBMITTALS

A. Product Data for each fencing system component and accessory item.

B. Shop Drawings, showing materials, construction and fabrication details, layout and erection diagrams as required, finish of materials and methods of anchorage to adjacent construction. Indicate welding by AWS code symbols.

C. Samples
1. Color Selection Samples for each specified pre-finished item
2. Record Samples of selected finishes
3. Material Samples. If requested, submit samples of materials. Samples of finials, caps, and accessories shall be whole pieces.

D. Special Environmental Requirements. Submit documentation regarding recycled content and local/regional materials for all steel fence and gate components. Use the Special Environmental Product Documentation Submittal Form appended to Section 01 35 43.

1.04 DELIVERY, STORAGE AND HANDLING

A. Stack, store, and handle fencing sections and components to prevent damage during transit and storage at the site. Follow manufacturer's instructions.

1.05 PROJECT CONDITIONS

A. Verify Existing Conditions. Verify conditions, affecting work of this Section, by taking accurate measurements at site of dimensions, elevations, and grades. Fabricate work to fit measured dimensions.

1.06 SPECIAL WARRANTY

A. Manufacturer and installer shall jointly warrant that the installed fencing and gates are and will remain free from defects in material and workmanship including cracking, peeling, blistering and corroding of finish for a period of at least 5 years from the date of Substantial Completion. Upon written notice from Owner, they shall promptly, without cost, and with the least practicable inconvenience to Owner correct such defects.

PART 2 - PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Gates that are part of the accessible route shall meet all the requirements of an accessible door in compliance with CBC Section 11B-404.

B. The levers of lever actuated latches or locks for accessible gates shall be curved with a return to within 1/2" of the gate surfaces to prevent catching on the clothing or persons.

C. Swing doors and gate surfaces within 10" of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16" of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plate shall be capped. CBC Section 11B-404.2.10.

2.02 MANUFACTURERS

A. Acceptable Manufacturers
1. Ameristar Fencing Products, Tulsa, OK. Product: Aegis II A & T Iron Works, Inc., New Rochelle, NY
2. Builders Fence Company, Sun Valley, CA
3. Century Tube, Port of Pine Bluff, AR
4. Or equal, approved in accordance with Division 01, General Requirements, for substitutions.

2.03 MATERIALS

A. Steel Material: ASTM A924, A123 and ASTM A653, hot-dipped galvanized, G-90 for sheet steel, cold-rolled, butt welded, square or rectangular, minimum 45,000 psi. A minimum of 62% of the steel material shall be derived from recycled scrap metal.
a. Model: Aegis II Fence Pickets: 1" x 14 GA square tubing, 4 inch centers.
b. Fence rails, top and bottom: formed steel 1-3/4" x 14 GA square.
c. Fence posts: 2-1/2" x 12 GA square, 8 feet on center nominal, 6 feet high.
d. Gate frame and pickets: same material as fence materials.

B. Threaded Bolts and Nuts: Standard, commercial quality, hot-dip, galvanized, steel conforming to ASTM A307.

C. Accessories: Internal retaining rod, panel brackets, post and picket caps, rubber grommets picket to rail.

2.04 COMPONENTS

A. Fencing: Ameristar Aegis II Industrial Weight, or equal
1. Style: Genesis G3, 3-rail, extended picket design with caps.
2. Color: black.

B. EXIT Gates: galvanized square tube, ASTM A500, Grade B, at lintels and gate posts, minimum galvanizing coating of 1.8 ounces per sq. ft. 2-1/2 inches square. Final finish to match fencing finish.

2.05 ACCESSORIES

A. Swing Gates: 1.75" x 14 gauge forerunner Double channel rail, 2" square x 11 gauge gate ends, and 1" square x 14 gauge pickets. Gates exceeding 6’ in width shall have 1.75" sq x 14 gauge intermediate upright. All rail and upright intersections hall be joined by welding. All pickets and rail intersections shall also be joined by welding. Gusset plates will be welded at each upright to rail intersection. Provide cable kits for additional truss for gates leaves over 6 feet.

B. Swing Gate Hardware. Provide hardware and accessories for each hinged, swing gate, galvanized and shop finished to match adjacent gate and fence components.

1. Hinges: weldable steel barrel type hinge, ball bearing, non-removable steel pin. Provide two hinges for each leaf up to 6 foot nominal height, and one additional hinge for each additional 24 inches in height, or fraction thereof. 5" barrel hinge, Model: 44-2003 King Architectural Metals, Los Angeles, CA, or equal. Two hinges per leaf for gates up to 5'-11" wide, three hinges per leaf for 6' to 10' wide gates. Locks: Self-latching bolt and deadbolt, 3/4 inch diameter, adjustable, lockable, with lever handle, by Ameristar Lock or equal, keyed lock. Hardware shall not require pinching, grasping or twisting motion. The lever of lever-activated latches or locks for an accessible gate shall be curved with a return to within 1/2" of the (face of) gate to prevent catching on the clothing or persons.
2. Double Gates: Provide center lockable cane bolt assembly mounted to gate vertical frame designed to engage strike with anchors, set in concrete. At double gates provide locking slide bolt. Cane Bolts not permitted at Path-of-Travel gates.
3. Gate Hardware: Shall be mounted at 40" above finish floor.
4. All gates intended for pedestrian use, including ticket gates shall comply with all applicable requirements of doors. All gates in the Path of Travel and as indicated on the drawings shall require Exit Devices (panic hardware) as specified above, CBC Sections 11B-309.4 and 11B-404.2.9. Signage is not permitted in lieu of accessible or panic hardware.

5. Exit Device at Exit Gates only, outswing in accordance with CBC Sections 1008.1.9, 1008.1.10, and 1008.2, Mounted 36" to 44" above finish floor. Exit Device (panic hardware) shall be mounted to provide 36" clear minimum below the device. Unlatching force not exceed 15# applied in direction of travel.
   a. Panic Bar: Exit Device: Sargent 3828F Series exit device, with sprayed alum enamel finish, 649 strike, and Trim Pack 28-K-LL, with 34 Series rim type cylinder for key operation, outside lever at single gates, devices in exit pathways where shown on drawings, attach to gate post, include cylinder. Lever handle on exterior of gate. Lever to return to within ½" of gate surface.
6. Accessories: 4" x 3" x 1/4" x 8" high galv. steel angle welded to strike-side frame and 1" x 3" x 1/4" thick bolt keeper.
   a. Fabricate galv. Steel lock box 16 ga x 3" high x 8" wide x 1-3/4" thick to encase lockset, weld all joints and grind smooth, touch up with galvanizing compound.

7. Perforated Metal Panel: Manufactured by McNichols Co. Tampa, FL. Aluminum Plate: Perforated , 0.125 inch thick with 1/4 inch diameter holes 42 percent open area [As specified in Section 05 50 00], 24 in. high by width of gate behind panic device centered at 40 in. above finish surface. Secure to gate frame with #8 stainless steel screws at 6 in on center.
8. Install 0.125 inch thick aluminum kick plate 10 inches high on push side (For larger gates install at both sides). Clear space below gate shall be 3 inches maximum from walking surface on both sides of the gate. Secure with #8 stainless steel screws 4 places each kick plate minimum.

C. Lock Box: medium duty, lift-off lid, emergency-access, key-box; 1650 Series KnoxBox by the Knox Company, Newport Beach, CA, or equal. [Furnish with tamper switch, that will send signal to building alarm system if forced entry is attempted.

2.06 FABRICATION

A. Provide new stock of standard sizes specified or detailed. Fabricate materials in shop to produce high-grade metal work. Form and fabricate to meet required conditions.

B. Pickets, rails and posts shall be pre-cut to specified lengths. Rails pre-punched to accept rails.

C. Include bolts, screws and other fastenings necessary to secure work.

D. Conform applicable work to latest edition of AISC Specifications and AWS D1.1.

E. Accurately make and tightly fit joints and intersections in true planes with adequate fastenings.

F. Coordinate Work with work of other sections. Provide punchings and drillings indicated or required for attachment of Work to other Sections.

G. Welding: weld joints, unless otherwise indicated or specified, using shielded electric arc method. Use coated welding rods, not fluxed or type recommended by manufacturer for use with parent metal.

H. Grinding: Grind welds to smooth flush joints.

I. EXIT Gates: Fabricate posts and lintels to height indicated on drawing but no less than 6’-8", and ready to receive closer and gate hardware.

2.07 FINISHES

A. Base Coat: epoxy electrostatic powder coat over prepared galvanized steel, minimum thickness 2 mils.

B. Finish Coat: TGIC Polyester electrostatic powder coat topcoat. Thickness 2 mils, minimum.

C. Color: black.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify existing conditions are ready the work of this Section. Do not begin erection of fencing until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Post spacing: Line posts shall be spaced in line maximum of 96 inches on center.

B. Post Footings: Set posts in concrete footings 12 inches in diameter and 36 inches deep. Tops of footings: Crowned to shed water. Concrete mix: Minimum 3000 pounds per square inch.

C. Post Tops: Line posts shall be fitted with pressed steel caps. Gate post top: Welded flush and ground smooth .

3.03 GATES

A. Gate posts shall be set in accordance with the spacings shown in the drawings.

B. Fabricate gates to size and configuration indicated on Drawings, complete with gate hardware.

C. Install locking fittings to accommodate owner's keying system.

D. Attachments to gate shall be permanently secured to assembly. No clamp-on or exposed bolted fittings shall be permitted.

E. All gates intended for pedestrian use, [including ticket gates], shall comply with all applicable requirements of doors. All gates in the Path of Travel and part of the accessible route and as indicated on the drawings shall require Exit Devices (panic hardware) and meet all the requirements of an accessibly door in compliance with CBC Section 11B-404 and as specified above. Signage is not permitted in lieu of accessible or panic hardware.

END OF SECTION

SECTION 32 80 00

IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY

A. Scope of Work:

1. Furnish all labor, materials, tools, equipment, and transportation required to perform and complete the installation of an automatic sprinkler irrigation system, including all piping, sprinkler heads, controls, connections, testing, etc. as shown on the Drawings and as specified herein. The water source for this project is potable water.
2. Utilize and accept as standards manufacturer's recommendations and/or installation details for any information not specifically detailed on the Drawings.

1.2 RELATED REQUIREMENTS

A. Section 01 6116, Volatile Organic Compound (VOC) Restrictions, for VOC limits pertaining to adhesives, sealants, fillers, primers, and coatings.

B. Section 03 1000, Concrete Forming.

C. Division 26, Electrical

D. Section 31 0000, Earthwork.

E. Section 31 2333, Trenching and Backfilling.

F. Section 32 9000, Landscaping.

1.3 REFERENCES AND STANDARDS

A. California Building Code (CBC), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

B. California Green Building Standards Code (CALGreen), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

1.4 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:

1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.
3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements

B. Pre-Installation Meeting:

1. Request and hold a pre-installation meeting prior to beginning the work of this Section. Parties required to be in attendance are the Landscape Contractor, Project Inspector, Owner's Representative, and the Landscape Architect.

1.5 ACTION SUBMITTALS

A. Product names are used as standards; provide proof as to equality of any proposed material and do not use other materials or methods unless approved in writing by the Owner's Representative. Submit no more than one request for substitution for each item. The decision of the Owner's Representative is final.

B. Use equipment capacities specified herein as the minimum acceptable standards.

C. List materials in the order in which they appear in Specifications; include substitutions. Submit the list for approval by the Owner's Representative.

D. Make any mechanical, electrical, or other changes required for installation of any approved, substituted equipment to satisfaction of Owner's Representative and without additional cost to Owner. Approval by Owner's Representative of substituted equipment and/or dimensional drawing does not waive these requirements.

E. Do not construe approval of material as authorization for any deviations from Specifications unless attention of Owner's Representative has been directed to specified deviations.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data for the following:

1. For landscape contractor.

B. Certification: Installer for central control system.

C. Sample of manufacturers' warranty.

D. Record of Pre-Installation Meeting.

E. Sustainable Design:

1. General:
    a. Submit information necessary to establish and document compliance with the California Green Building Standards Code.
    b. Sustainable design submittals are in addition to other submittals.
2. The following information shall be provided:
    a. Adhesives and Sealants: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.
    b. Paints and Coatings: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.

1.7 CLOSEOUT SUBMITTALS

A. Warranty/Guarantee: Submit executed warranty and subcontractor's guarantee.

B. Maintenance and Operating Instructions:

1. Furnish operating maintenance instructions bound in a hardback binder and indexed. Start compiling data upon approval of list of materials. Do not request final inspection until booklets are approved by Owner's Representative.
2. Incorporate the following information in these sets:
    a. Complete operating instructions for each item of irrigation equipment.
    b. Typewritten maintenance instructions for each item of irrigation equipment.
    c. Manufacturer's bulletins which explain installation, service, replacement parts, and maintenance.
    d. Service telephone numbers and/or addresses posted in an appropriate place as designated by Owner's Representative.

C. Record Drawings

1.8 QUALITY ASSURANCE

A. Qualifications: Work must be complete by a licensed Landscape Contractor. Provide proof of five years' continuous experience in landscaping and irrigation of projects of similar size.

B. Certification: Ensure that the contractor installing the Central Control System is trained and certified in the installation of the Central Control System. The training and certification must have been completed within two years prior to the installation date.

C. Work Force: Ensure that an experienced foreman is present at all times during installation. Keep the same foreman and workers on the job from commencement to completion.

D. Reviews: Specifically request reviews of all items listed in Article INSPECTION REQUIREMENTS, prior to progressing to the next level of work.

E. Standards:

1. Provide work and material in full accordance with the rules and regulations of the National Electric Code; the Uniform Plumbing Code; and other applicable state or local laws or regulations.
2. Furnish, without extra charge, additional material and labor required to comply with these rules and regulations, though the work may not be specifically indicated in the Specifications or Drawings.
3. Where the Specification requirements exceed those of the above-mentioned codes and regulations, comply with the requirements in the Specifications.

1.9 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle in strict conformance with the manufacturer's written recommendations.

B. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles, with tags and labels intact. All material containers or certificates shall be clearly marked by manufacturer as to contents for inspection.

C. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soilage, extreme temperatures, and humidity. Lay flat, blocked off ground.

D. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect related work and material.

E. Handle plastic pipe carefully, especially protecting it from prolonged exposure to sunlight. Store pipe on beds that are the full length of the pipe, and keep pipe flat.

1.10 FIELD CONDITIONS

A. Information on Drawings relative to existing conditions is approximate. During progress of construction, make deviations necessary to conform to actual conditions, as approved by Owner's Representative, without additional cost to Owner. Accept responsibility for any damage caused to existing services. Promptly notify Owner's Representative if services are found which are not shown on Drawings.

B. Protect existing trees-to-remain as specified in "Existing Tree Protection" in Article PREPARATION, in Part 3 of this Section.

C. Protect existing utilities within construction area. Repair damages to utility lines that occur as a result of operations of this work.

D. Verify dimensions at building site and check existing conditions before beginning work. Make changes necessary to install work in harmony with other crafts after receiving approval by Owner's Representative.

1.11 INSPECTION REQUIREMENTS

A. Obtain verification from Project Inspector for the following at the appropriate times during construction and prior to further progression of work in this Section:

1. Pressure testing of all mainlines and lateral lines (See "Hydrostatic Tests – Open Trench" in Article FIELD QUALITY CONTROL, in Part 3 of this Section),
2. Trench depth,
3. Sleeves under pavement,
4. Flushing of all mainlines and lateral lines,
5. Backfill and pipe bedding,
6. Layout of heads,
7. Operation of system and coverage adjustments (with Landscape Architect) after system is fully automated and operational, backfill of trenching is completed, and surface has been restored to original grades.

B. In case of failure to obtain any verification by the Project Inspector as required above, remove and replace work as necessary to obtain the verification at no additional cost to the Owner.

1.12 WARRANTY AND GUARANTEE

A. Manufacturer: In addition to the Contractor's and Subcontractor's Guarantee, furnish Owner with manufacturer's available fully executed written warranty against defects in materials and workmanship.

B. Subcontractor Guarantee: Shall include damage by leaks and settlement of irrigation trenches.

PART 2 - PRODUCTS

2.1 GENERAL

A. Use materials as specified; any deviation from the Specifications must first be approved by the Owner's Representative in writing.

2.2 DESIGN AND PERFORMANCE CRITERIA

A. Sustainable Design:

1. VOC emissions for field-applied adhesives, sealants, and sealant primers must comply with limits specified in Section 01 6116.
2. VOC emissions for field-applied paints and coatings must comply with limits specified in Section 01 6116.

2.3 MATERIALS

A. Automatic Control Valves: As indicated on Drawings.

B. Gate Valve: As indicated on Drawings.

C. Pipe and Fittings:

1. PVC pipe: As indicated on Drawings.
2. PVC fittings three-inch (3") size and smaller: High impact, standard weight, Schedule 40, molded PVC as manufactured by George Fischer, Lasco, Spears, or approved equal.
3. All plastic pipe and fittings: Continuously and permanently marked with manufacturer's name, type of material, IPS size, schedule, NSF approval, and code number.
4. Threaded PVC pipe and nipples: IPS Schedule 80 when necessary to use threaded connections to gauges, valves, or control valves. Threaded adapters may be used in place of nipples when making pipe to valve connections.
5. Use 45-degree fittings for changes in depth of pipe, and at transition from main line to automatic control valves.
6. Piping above ground: Schedule 40 galvanized steel with cast-iron fittings.

D. PVC Primer: Weld-On P-70 Purple Primer or approved equal.

E. PVC Glue: Weld-On 711 Gray heavy bodied PVC Cement or approved equal.

F. Sprinkler Heads: As indicated on Drawings.

G. Sleeves: As indicated on Drawings.

H. All Valve Boxes and Covers: Manufactured, green with “Irrigation – Non-Potable” permanently embossed on cover. Carson, Rainbird or approved equal.

I. Automatic Sprinkler Two-Wire Decoder Cable:

1. Connections between remote control valve decoders and controller: Type UF, 14 AWG direct burial polyethylene (PE) insulated wire in a polyethylene jacket with rip cords, P7354D or approved equal. If multiple controllers are used, a different color jacket is to be used for each controller
2. UL Listed waterproof sealing pack for wire connections: 3M DBR/Y-6, or approved equal.
3. Provide adequate working space around electrical equipment in compliance with local codes and ordinances.
4. Electrical, other than low voltage, such as power wiring, conduit, fuses, thermal overloads and disconnect switches, is included under Division 26 of these Specifications.

J. Single Station Decoder: As indicated on Drawings.

K. Trace Wire:

1. Direct burial #12 AWG Solid, steel core soft drawn tracer wire, 250# average tensile break load, 30 mil high molecular-high density polyethylene jacket complying with ASTM-D-1248, 30-volt rating. Color shall be green.
2. Connectors: UL Listed waterproof sealing pack for wire connections: 3M DBR/Y-6, or approved equal.

L. Unions And Flanges:

1. Steel unions and flanges two inches (2”) and smaller: 150 lb. screwed black (brass to iron seat) or galvanized malleable iron (ground joint).
2. Steel unions and flanges two and one-half inches (2 ½”) and larger: 150 lb. black flange union, flat-faced, full gasket.
3. Gaskets: One-sixteenth inch (1/16”) thick rubber Garlock No. 122, Johns-Manville or approved equal.
4. Flange Bolts: Open-hearth bolt steel, square heads with cold pressed hexagonal nuts, cadmium plated in ground. Provide copper-plated steel bolts and nuts or brass bolts and nuts for brass flanges.

M. Sand for Trench Backfill: Natural sand, free of roots, bark, sticks, rags, or other extraneous material

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to commencement of the work of this Section, obtain written verification from the project Civil Engineer that the rough grade in landscape areas is in conformance with Section 31 0000 - Earthwork.

B. Examine conditions of work in place before beginning work; report defects.

3.2 PREPARATION

A. Scheduling: Notify the Project Inspector prior to commencing and/or continuing the work of this Section. Remove and replace, at no cost to Owner, any work required as a result of failure to give the appropriate notification.

B. Measurements: Take field measurements; report variance between plan and field dimensions.

C. Protection: Maintain warning signs, shoring and barricades as required. Prevent injury to, or defacement of, existing improvements. At no additional cost to Owner, repair or replace items damaged by installation operations.

D. Existing Tree Protection:

1. Avoid unnecessary root disturbance, compaction of soils within drip line, or limb breakage.
2. Do not store material or dispose of any material other than clean water within the drip line.
3. Provide adequate irrigation during construction.
4. Replace any tree damaged during construction with a tree of equal size and value at no additional cost to Owner.
5. Adjust trench locations in field to minimize damage to existing elements and plant roots of trees-to-remain at no additional cost to Owner.

E. Surface Preparation: Prior to beginning sprinkler irrigation work, complete placement of topsoil as specified in Section 31 0000 – Earthwork. Notify Project Inspector of irregularities if any.

3.3 GRADING

A. Install all irrigation features to their finished grade and at depths indicated. Complete and /or accommodate all rough grading and/or finish grading before commencing with trenching.

3.4 LAYOUT

A. Lay out work as accurately as possible to Drawings. Drawings are generally diagrammatic to extent that swing joint offsets and fittings are not shown. Record all changes on the Record Drawings.

B. Do not willfully install the irrigation system as shown on Drawings when it is obvious, in the field, that obstructions or other discrepancies exist which may not have been considered in the design. Notify Owner's Representative of discrepancies before proceeding.

3.5 EXCAVATING AND TRENCHING

A. General: Perform excavations as required for installation of work included under this Section, including shoring of earth banks to prevent cave-ins. Restore surfaces, existing underground installations, etc., damaged or cut as result of this work to their original condition and in a manner approved by the Landscape Architect.

B. Width:

1. Make trenches wide enough to allow a minimum of six inches (6") between parallel pipelines and three inches (3") between side of pipe and side of trench. Do not allow stacking of pipe within trench.
2. Allow a minimum clearance of twelve inches (12") in any direction from parallel pipes of other trades.

C. Preparation of Excavations: Remove rubbish and rocks from trenches. Bed pipe on a minimum of three inches (3") of clean, rock-free soil to provide a firm, uniform bearing for entire length of pipeline. If clean, rock-free soil is not available, use sand for pipe bedding. See Backfill and Compacting for the remainder of the trench backfill.

D. Minimum depth of cover: Unless shown otherwise, provide the following minimums:

1. Mainline: twenty-four inches (24") cover.
2. Lateral line: twelve inches (12") cover for spray heads, and eighteen inches (18") cover for rotor heads.

E. Conflicts with other trades:

1. Hand-excavate trenches where potential conflict with other underground utilities exist.
2. Where other utilities interfere with irrigation trenching and piping work, adjust the trench depth as instructed by Owner's Representative.

3.6 BACKFILL AND COMPACTING

A. General: Do not begin until hydrostatic tests are completed and when system is operating and after required tests and inspections have been made.

B. Backfill directly around the pipe: Cover pipe with a minimum of three inches (3") of clean, rock-free soil. If clean, rock-free soil is not available, use sand for three inches (3") of backfill above the pipe. The remainder of the trench backfill material can be native soil or material described below. Do not allow wedging or blocking of pipe.

C. For backfill of trenches under paving areas:

1. See Section 31 0000 – Earthwork for compaction rates and material
2. See Section 31 2333 – Trenching and Backfilling for trench backfill procedure.

D. For backfill of trenches in landscape areas:

1. Place backfill in six-inch (6”) layers and compact with an acceptable mechanical compactor.
2. Compact backfill material in landscape areas to eighty-five percent (85%) maximum dry density of the soil.
3. If settlement occurs along trenches, make adjustments in pipes, valves, and sprinkler heads, soil, sod or paving as necessary to bring the system, soil, sod or paving to the proper level or the permanent grade, without additional cost to the Owner.

E. Excess Soil: Remove all rocks, debris, and excess soil that results from sprinkler irrigation trenching operations, landscape planting, and soil preparation operations off site at no additional cost to the Owner. If soil meets topsoil requirements in Section 31 0000 – Earthwork, it may be used for finish grading.

F. Finishing: Dress-off areas to eliminate construction scars.

G. per path. Provide eighteen inches (18”) of slack wire at each automatic control valve.

3.7 TWO-WIRE DECODER CABLE

A. General: Install control wires beneath sprinkler main line whenever possible.

B. Slack Cable: Provide eighteen inches (18”) of slack cable at each automatic control valve. Slack cable shall be coiled and left in the valve box.

C. Expansion and Contraction: Snake cable in trench to allow for contraction of cable.

D. Cable Passing Under Existing or Future Paving or Construction: Encase in PVC Schedule 40 or galvanized steel conduit extending at least twelve inches (12”) beyond edges of paving or construction.

E. Connections: Install cable connections in a waterproof sealing pack.

F. Splicing: Permit splicing only on runs exceeding 500 feet. Locate all splices within valve boxes.

G. Cable Termination: Install cable in a valve box with eighteen inches (18”) of slack cable coiled and individually capped with approved waterproof sealing pack. Ground cable at all cable terminations.

3.8 TRACE WIRE

A. General: Install trace wire above sprinkler main line whenever possible; tape wire to mainline pipe at 10’ intervals to ensure the wire remains adjacent to the pipe.

B. Wire Connections: Install wire connections in a waterproof sealing pack.

C. Trace wire access points shall be accessible at all automatic control valves.

D. At all mainline end caps, a minimum of six feet (6’) of tracer wire shall be coiled and secured to the cap for future connections. The end of the tracer wire shall be spliced to

the wire of a six-pound zinc anode and is to be buried at the same elevation as the irrigation mainline.

E. Testing: The contractor shall perform a continuity test on all trace wires in the presence of the client. If the trace wire is found to be not continuous after testing, Contractor shall repair or replace the failed segment of the wire.

3.9 FLUSHING LINES

A. Thoroughly flush lines prior to installing valves, performing hydrostatic testing, or installing sprinklers. Divert water to prevent washouts.

3.10 AUTOMATIC CONTROL AND QUICK COUPLER VALVES

A. Install where shown and where practical; place no closer than twelve inches (12”) to walk edges, building walls, or fences. Refer to detail for example.

B. Thoroughly flush mainline before installing valve.

C. Install valves in ground cover areas where possible.

3.11 PIPING

A. General: Install in conformance with reference standards, manufacturer’s written directions, as shown on Drawings and as herein specified.

B. Workmanship:

1. General: Install sprinkler irrigation equipment in planted areas throughout the site.
2. Coordination: Organize location of sleeves with other trades as required.

C. Pipe Line Assembly:

1. General:
   a. Cutting: Cut pipe square; remove rough edges or burrs.
   b. Solvent-welded Connections: Use materials and methods recommended by the pipe manufacturer.
   c. Brushes: Use non-synthetic brushes to apply solvents and primer.
   d. Cleaning: Clean pipe and fittings of dirt, moisture, and debris prior to applying solvent or primer.
   e. Assembly: Allow pipe to be assembled and welded on the surface or in the trench.
   f. Expansion and Contraction: Snake pipe from side to side of trench to allow for expansion and contraction.
   g. Location: Locate pipes as shown on Drawings except where existing supply valves, utilities or obstructions prohibit or where slight changes are approved to better suit field conditions.
2. Flexible Elastometric Seal Joints:
   a. General: Assemble in strict conformance with the pipe manufacturer’s instruction.

b. Rubber Rings: Use rubber rings specific for water service systems.

c. Cleaning: Thoroughly clean ring and groove of dirt, moisture and debris using a clean, dry cloth. Do not use solvents, lubricants, cleaning fluids or other material for cleaning.

d. Seating: Properly seat ring in groove.

e. Spigot:

1) General: Clean spigot-end of pipe as in “Cleaning” above prior to applying lubricant recommended by pipe manufacturer.

2) Seating: Insert spigot into bell and seat to full depth required.

3. Connections:

a. Threaded Plastic Pipe Connection:

1) Use Teflon tape or pipe joint compound.

2) When assembling to threaded pipe, take up joint no more than one full turn beyond hand-tight.

b. Metal Valves and Plastic Pipe: Use threaded plastic male adapters.

c. Metal to Metal Connections:

1) Use specific joint compound or gasket material for type of joint made. Where pipe of dissimilar metals are connected, use dielectric fittings.

2) Where assembling, do not allow more than three full threads to show when joint is made up.

d. Where assembling soft metal (brass or copper) or plastic pipe, use strap-type friction wrench only; do not use a metal-jawed wrench.

e. Threading:

1) Do not permit the use of field-threading of plastic pipe or fittings. Use only factory-formed threads.

2) Use factory-made nipples wherever possible. Permit the use of field-cut threads in metallic pipe only where absolutely necessary. When field-threading, cut threads accurately on axis with sharp dies.

3) Use pipe joint compound for all threaded joints. Apply compound to male thread only.

4. Sleeves and conduits:

a. Use sleeves of adequate size to accommodate retrieval for repair of wiring or piping and extend a minimum of twelve inches (12”) beyond edges of walls or paving.

b. Provide removable, non-decaying plug at end of sleeve to prevent entrance of soil.

5. Unions: Locate unions for easy removal of equipment or valve.

6. Capping: Plug or seal opening as lines are installed to prevent entrance materials that would obstruct pipe. Leave in place until removal is necessary for completion of installation.

3.12 SPRINKLER HEADS

A. Sprinkler heads: Locate as shown on the Drawings except where existing conditions prohibit, or slight changes are approved to achieve as good or better coverage under the same conditions. Do not allow sprinkler head spacing to exceed the maximum shown on the Drawings. Plumb heads.

B. Handling, Assembly of Pipe, Fittings, and Accessories: Allow only skilled tradesmen to handle and assemble pipe, fittings and equipment. Keep interior of pipes, fittings and accessories clean at all times. Close ends of pipe immediately after installation; leave closure in place until removal is necessary for completion of installation. Do not permit bending of pipe.

C. Flushing: Remove end heads and operate system at full pressure until all rust, scale, and sand is removed. Divert water to prevent ponding or damage to finished work.

D. Coverage: Accept responsibility for full and complete coverage of irrigated areas to satisfaction of Landscape Architect and make necessary adjustments to better suit field conditions at no additional costs to Owner.

3.13 FIELD QUALITY CONTROL

A. Visual Inspection: Verify that all pipe is homogenous throughout and free from visual cracks, holes, or foreign materials. Inspect each length of pipe. All materials are subject to impact test at the discretion of the Landscape Architect.

B. Hydrostatic Tests – Open Trench:

1. Center-load piping with a small amount of backfill to prevent arching or slipping under pressure.
2. Request the presence of the Project Inspector in writing at least forty-eight hours in advance of testing.
3. At no additional cost to Owner, test in the presence of the Project Inspector.
4. Apply continuous static water pressure of 100 psi when welded plastic joints have cured at least twenty-four hours, and with the risers capped, as follows: test main lines and submains for four hours; test lateral lines for two hours.
5. Repair leaks resulting from tests; and repeat tests.
6. Test to determine that all sprinkler heads function according to manufacturer's data and give full coverage according to intent of Drawings. Replace any sprinklers not functioning as specified with ones that do, or otherwise correct system to provide satisfactory performance.

C. Continuity Testing: Test locating device and control wires for continuity prior to and after back-filling operations.

3.14 CLEAN-UP

A. Remove debris resulting from work of this Section.

3.15 ADJUSTMENTS AND MAINTENANCE

A. Adjusting System: Prior to acceptance, satisfactorily adjust and regulate entire system. Set watering schedule on controller appropriate to types of plants and season of year. Adjust remote control valves to operate sprinkler heads at optimum performance based on pressure and simultaneous demands through supply lines.

B. System Layout: Provide reduced prints of Record Document irrigation plans, laminated in four (4) mil. plastic, of size to fit controller door. Enlarge remote-control valve designations as necessary for legibility. Color-code areas covered by each station. Affix plans to inside of controller door.

C. Instructions: Upon completion of work, instruct maintenance personnel on operation and maintenance procedures for entire system.

D. Flow Charts: Record and prepare an accurate flow-rate chart for each automatic control valve.

3.16 RECORD DRAWINGS

A. As specified in Section 01 3300, Submittal Procedures, and the following:

1. Regularly update plans of the system and any changes made to the system throughout the project. Record all changes on this plan before trenches are back-filled.
2. Record complete as-built information and submit the Record Drawings to the Architect before applying for payment for work installed.
3. Show the following on the Record Drawings accurately to scale and dimensioned from two permanent points of reference:
    a. and spares Distance of mainline from nearby hardscape.
    b. Location of automatic control valves, quick couplers, and gate valves.
    c. Location and size of all sleeves.
    d. Location of automatic control wires.

END OF SECTION

SECTION 32 90 00

LANDSCAPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Soil Preparation and Fertilization
2. Planting
3. Sodding
4. Weed Control
5. Mulch
6. Clean-up
7. Landscape Maintenance Period

B. Work not included in this Section: Landscape elements such as concrete walks, fencing, outdoor lighting, rough grading, and clearing are not a part of this Section unless shown on the landscape Drawings.

1.2 RELATED REQUIREMENTS

A. Section 01 8113, Sustainable Design Requirements, for CAL-Green **[and Collaborative for High Performance Schools (CHPS)]** general requirements and procedures.

B. Section 31 0000, Earthwork.

C. Section 32 8000, Irrigation

1.3 REFERENCES AND STANDARDS

A. California Building Code (CBC), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).

B. California Green Building Standards Code (CALGreen), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).

C. EPA - Federal Insecticide, Fungicide and Rodenticide Act.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:

1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.

B. Pre-Installation Meeting: Request and hold a pre-installation meeting prior to beginning the work of this Section. Parties required to be in attendance are the Landscape Contractor, Project Inspector, Owner's Representative, and Landscape Architect.

C. Pre-scheduled On-site Project Meetings: Hold regularly-scheduled (monthly or bimonthly as determined by the Landscape Architect) on-site project meetings with the Landscape Architect, Project Inspector and Owner's Representative. Dates and times will be jointly agreed upon.

1.5 ACTION SUBMITTALS

A. Plant Material: Within fifteen (15) days after award of contract, locate plant materials required for construction. Ensure that trees and shrubs are contract- grown from a certified nursery. Notify Owner's Representative of plant material "tied off" for review at selected nursery. If specified material is not obtainable, submit the following to Owner's Representative: proof of non-availability, proposal for use of equivalent material, photographs of alternative choices of plant material. Include clear, written description of type, size, condition, and general character of plant material.

B. Data Sheets:

1. Provide product data for each type of landscape material indicated in the Drawings and Specifications.
2. Letter from the manufacturer stating that the soil amendment material submitted for use on this project has no metal fragments or foreign objects.

C. Samples: Submit samples of the following materials to Landscape Architect for approval:

1. Soil amendment: (3) one-quart zip-locked plastic bags.
2. Bark Mulch: (3) one-quart zip-locked plastic bags.
3. Imported Topsoil: (3) one-quart zip-locked plastic bags.

D. Provide soils analysis reports prepared by a qualified soils laboratory in accordance with the Soils Testing Requirements under "Soil Testing" in Article SOIL TESTING, in Part 3 of this section.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape contractor.

B. Prior to planting, submit copies of all trucking or packaging tags for all soil amendment, fertilizer and other additives to Landscape Architect so the quantities can be verified.

C. Record of Pre-Installation Meeting.

1.7 CLOSEOUT SUBMITTALS

A. Guarantee: Submit Subcontractor's guarantee.

B. Record Drawings.

1.8 QUALITY ASSURANCE

A. Qualifications: Work must be completed by a licensed Landscape Contractor. Provide proof of five years of continuous experience in landscaping and irrigation of projects of similar size (+\- 20% of the construction cost) and scope for education campuses. Landscape Contractor to have a minimum of two projects either completed or in construction in the last five years.

B. Work Force: Ensure that an experienced foreman is present at all times during installation. Keep the same foreman and workers on the job from commencement to completion.

C. Reviews: Specifically request reviews of all items listed below in Article INSPECTION REQUIREMENTS prior to progressing to the next level of work. The Owner's Representative reserves the right to inspect and reject material, both at place of growth and at site, before and/or after planting, for compliance with requirements for name, variety, size and quality.

D. Reference Standards: Meet or exceed Federal, State and County laws requiring inspection of all plants and planting materials for plant disease and insect control.

E. Plant Material:

1. Conform to the current edition of Horticultural Standards for quality of Number 1 grade nursery stock as adopted by the American Association of Nurserymen. Conform to sizes specified on plant legend. Select plants which have a natural shape and appearance.
2. Select only plants that are true to name, and tag one of each bundle or lot with the name of the plant in accordance with the standards of practice of the American Association of Nurserymen. In all cases, botanical names shall take precedence over common names.
3. Tag each plant of a patented variety with the variety and identification number, where applicable, as it is delivered to the job site.
4. Select only plants which have been nursery-grown in accordance with good horticultural practices and which have been grown under climatic conditions similar to those in the locality of the project for at least one year.
5. Select only plants which are typical of their species or variety; have normal habits of growth; are sound, healthy, vigorous, well-branched and densely-foliated when in leaf; are free of disease, insect pests, eggs or larvae; and have a healthy and well-developed root system.
6. Select only container stock that has been grown in the containers in which delivered for at least six (6) months, but not over two (2) years. Provide samples to show that there are no root-bound conditions.
7. Do not use plants that are severely pruned or headed-back to meet size requirements.
8. Do not plant container-grown plants that have cracked or broken balls of earth when taken from the container. Remove canned stock carefully from cans after containers have been cut on two sides with tin snips or other approved cutter.

9. At any time prior to final acceptance, be prepared to replace any plants that are rejected by the Owner's Representative because of physical damage to the plant.
10. Do not remove container-grown stock from containers before time of planting.
11. Be prepared to replace plants which are rejected by the Owner's Representative for the following reasons:
    a. Trunk bark damage caused by sunburn,
    b. Trunk bark wounds caused by rubbing stakes or ties,
    c. Trunk bark damage caused by ties that have girdled the tree,
    d. Tree head development that is lopsided and not symmetrical in form,
    e. Tree branches that cross or touch,
    f. Tree branches with double leaders (unless multi-trunk trees are specified).
12. Stake shrubs with one-inch by one-inch by eighteen-inch (1"x1"x18") stakes in such manner that the stakes are not visible, and tie to upright position if they lean and/or are not growing in a vertical position.
13. Furnish quantities necessary to complete the work as shown on the Drawings and, if necessary, make up for any discrepancies in the quantities given in the Plant List at no additional cost to Owner.

1.9 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

B. Coordinate a time for the Landscape Architect to inspect the plants upon their delivery to the project site.

C. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways or pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

1.10 FIELD CONDITIONS

A. Planting Season Limits: Do not plant when grounds are wet or temperature is below 25° F. Do not proceed with any soil preparation and fertilization if all planting cannot be completed within Planting Season Limit.

1.11 INSPECTION REQUIREMENTS

A. Landscape Architect reserves the right to examine and reject plant material both at place of growth and at site, before and after planting, for compliance with requirements of name, variety, size, and quality.

B. Obtain verification from Project Inspector for the following at the appropriate times during construction and prior to further progression of work in this Section:

1. Rough grading is to tolerances specified in Section 31 0000 – Earthwork.
2. The placement of landscape backfill material is as specified in this Section.
3. Prior to the commencement of planting operations specified in this Section, the coverage and operation of the sprinkler irrigation system are as specified in Section 32 8000 - IRRIGATION.
4. Required Test: For each load of soil amendment delivered to the site, spread at least two cubic yards (2 cy) of material onto a paved surface approximately two inches (2") deep. Pass a magnetic rake over the material in two directions. If any metal is found, test the entire load in the same manner. Perform all testing in the presence of the Project Inspector.
5. Soil amendments, fertilizer, bark mulch have been delivered to the site by the supplier, the invoices from the supplier indicate the project name and quantities delivered, and the Project Inspector has received copies of all such documents.
6. Prior to planting, amendments and conditioners have been incorporated as per pre-planting recommendations, and planting areas have been made ready to receive planting.

C. In case of failure to obtain any verification by the Project Inspector as required above, remove and replace work as necessary to obtain the verification at no additional cost to the Owner.

1.12 PROTECTION

A. Provide protection for persons and property throughout progress of work. Use temporary barricades as required. Proceed with work in such manner as to minimize spread of dust and flying particles and to provide safe working conditions for personnel. Store materials and equipment where directed.

B. Existing Construction: Execute work in an orderly and careful manner to protect paving, work of other trades, and other improvements.

C. Existing Utilities: Provide protection for existing utilities within construction area. At no additional cost to Owner, repair any damages to utility lines that occur as a result of this work.

D. Landscaping: Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods.

1.13 PLANTING SCHEDULE

A. Install, establish, and maintain all lawn areas for a minimum of ninety (90) days prior to date of substantial completion. Coordinate schedule with other work and overall project schedule. Failure to install lawn areas by this date shall result in assessment of liquidated damages.

B. Proceed with work in an orderly and timely manner to complete installation of landscaping within contract limits.

1.14 LANDSCAPE MAINTENANCE PERIOD REQUIREMENTS

A. Beginning of Landscape Maintenance Period:

1. General: Landscape Maintenance Period does not begin until all work is installed and as determined by Landscape Architect, in writing.
2. On-site Inspection: When all work is complete, request and hold a meeting to include the Landscape Architect, Project Inspector, Architect and Owner's Representative who must together authorize and determine the start date for the landscape maintenance period. Coordinate and give notice of the date and time of the on-site meeting to all parties at least forty-eight (48) hours in advance.
3. Acceptability: In cases where the lawn has reached adequate fullness and germination in some areas but not all, and authorization has not been given to begin the maintenance period, proceed with mowing, trimming, spraying, etc., as necessary prior to the beginning of the maintenance period.

B. Duration of Landscape Maintenance Period:

1. The Landscape Maintenance Period shall continue for a minimum of ninety (90) calendar days. During this time, continuously maintain all areas involved until final acceptance of the work by the Owner's Representative. See Landscape Maintenance Period procedure in Article LANDSCAPE MAINTENANCE, in Part 3 of this Section.

1.15 GUARANTEE

A. The guarantee period for lawn and plant material shall be the duration of the landscape maintenance period, from commencement until final acceptance of the work of this Section.

B. During the guarantee period, repair and/or replace plants and lawn not in satisfactory growing condition, as determined by Owner's Representative, without additional cost to Owner. Plants are to be replaced in accordance with Article LANDSCAPE MAINTENANCE in Part 3 of this Section, using plants of the same kind and size specified in plant list.

PART 2 - PRODUCTS

2.1 GENERAL

A. Use material in new and perfect condition as specified. Any deviations or substitutions from the Specification and Drawings must first be approved by Owner's Representative in writing prior to use.

2.2 SOIL PREPARATION MATERIALS

A. Topsoil: Fertile; friable; natural loam surface soil; reasonably free of subsoil, clay lumps, brush, weeds and other litter; and free of roots, stumps, stones/rocks, and other extraneous or toxic matter harmful to plant growth.

B. Soil Amendment: One-percent nitrogen-impregnated bark product with a ninety-percent (90%) bark base and zero to one-quarter inch (0-1/4”) particle size, or approved equivalent. Do not spread until testing requirements have been satisfied.

C. Fertilizer/Soil Conditioner: Gro-Power Plus or approved equal.

D. Fertilizer for Trees and Shrubs: Seven-gram Gro-Power Planting Tablets (12-8-8 NPK) or approved equal.

E. Vitamin B-1: "Superthrive", "Liquinox Start", "Cal-Liquid", or approved equal.

2.3 MISCELLANEOUS LANDSCAPE MATERIALS

A. Bark Mulch: Untreated, shredded cedar.

B. Tree-staking System: As indicated on Drawings.

C. Pre-Emergent Weed Control: Oxadiazon, “Treeflan”, “Ronstar 2G”, "Surflan" (Elano Products Company), or approved equal.

2.4 PLANT MATERIAL:

A. Nursery Plant Stock:

1. As indicated on Drawings. Do not remove container-grown stock from containers until planting time. Plants shall be true to name.
2. Healthy, shapely, well-rooted, not pot-bound, free from insect pests or plant diseases and properly "hardened off" before planting. Replace plants that are not alive or are not in satisfactory growing condition, as determined by the Landscape Architect, without additional cost to Owner. The Landscape Architect may reject plants before and/or after planting.
3. Labeled. Label at least one tree and one shrub of each species with a securely-attached, waterproof tag bearing legible designation of botanical and common name.

B. Lawn Sod: Eighty percent (80%) Perennial Ryegrass and twenty percent (20%) Kentucky Bluegrass.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Examine the site, verify grade elevations, and observe conditions under which work is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Owner's Representative.

B. Proceed with complete landscape work as rapidly as portions of the site become available, working within seasonal limitations for each kind of landscape work required.

C. Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand-excavate, as required, to minimize possibility of damage to underground utilities. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

D. When conditions detrimental to sod or plant growth are encountered, such as rubble fill, adverse drainage condition, or other obstructions, notify the Owner's Representative before planting.

3.2 SOIL TESTING

A. Coordinate soil testing in an expeditious and timely manner as required for on-site topsoil materials. Contract with a soil laboratory and include cost of sampling and testing in contract price. Take one (1) sample for every 5,000 square feet of landscape area up to a maximum of six (6) samples under the direction of and in the presence of the Owner's Representative.

B. Submit each sample, according to the quantity of soil required by testing laboratory, to a competent laboratory approved by the Owner's Representative.

C. Provide analysis of soil samples for pH, salinity, ammonia, phosphate, potassium, calcium, magnesium, boron, and sodium levels. Provide appraisal of chemical properties, including particle size determination, and recommendations for types and quantities of amendments and fertilizers.

3.3 PREPARATION

A. Clearing of Vegetation:

1. If live perennial weeds exist on site at the beginning of work, spray with a non-selective systemic contact herbicide as recommended and applied by an approved licensed landscape pest control advisor and applicator. Leave sprayed plants intact for at least 15 days.
2. Clear and remove existing weeds by mowing or grubbing off all plant parts at least one-quarter inch (¼") inch below surface of soil over entire areas to be planted.

B. Soil preparation:

1. Loosen soil in all planting areas, and on slopes flatter than 3:1 gradient, to a depth of six to eight inches (6" - 8") below finish grade. All debris, foreign matter, and

stones shall be removed prior to the placing of any fertilizers or conditioners. Soil preparation is for all shrub planting beds and sodded lawn areas.

2. Conduct the required soil tests and instruct the lab to include a minimum of the following soil improvements in the recommendation on the soils report.
   a. Soil Amendment: Two cubic yards (2 cy) per 1,000 square feet.
   b. Gro-Power Plus: One hundred fifty pounds (150 lbs) per 1,000 square feet.
   c. If the lab recommends less than six cubic yards (6 cy) of soil amendment, the excess bid amount shall be applied to the cost of any additional recommended soil improvements, or returned to the Owner as a credit
3. Apply amendments as follows, using rates recommended by the soils testing laboratory (the rates of amendments shown below are for bidding purposes only):
   a. Fertilizer/Soil Conditioner: Broadcast 150 pounds of Gro Power Plus per 1,000 square feet in all planting areas and rototill to a depth of six to eight inches (6" - 8"). Remove from the site any rock and debris brought to the surface by cultivations.
   b. Apply soil amendment to all planting areas at the rate of six cubic yards (6 cy) per 1,000 sf and rototill into the top six to eight inches (6" – 8").
4. Upon completion of finish grading, request an review and obtain approval of Landscape Architect prior to commencement of planting.

C. Finish Grading for all Planting areas

1. Refer to Earthwork Specification Section for Rough Grading.
2. Grade to elevations and contours shown on Drawings. Fill low spots with landscape backfill material and grade to surface drain in manner indicated on Drawings.
3. Finish-grade so that the entire area within the contract lines has a natural and pleasing appearance as specified and as directed by Landscape Architect.
4. Adjust sprinkler heads one-half inch above finish grade in preparation to receive sod. Reset sprinkler heads flush to grade after turf has germinated.
5. Flag the sprinkler heads and valve markers.

D. Planting Pits for Trees:

1. Excavate pits with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage.
2. Set container-grown stock in center of pit on earth pedestal. Separate roots and/or prune roots as directed by Landscape Architect. In hot weather, pre-wet pit. Loosen outside roots from sides and bottom of root ball. When set, place additional backfill around base and sides of root ball. Work each layer to settle backfill and eliminate voids and air pockets. Water after placing final layer of backfill.
3. Loosen hard subsoil in bottom of excavation. Extend excavation as required to insure proper drainage from plant pits.
4. Fill excavated planting pits with water to half the depth of pit. Pits should drain within four hours (4 hrs). If planting pits do not drain, notify Project Inspector

immediately. Do not proceed with planting until Landscape Architect has resolved a method to provide drainage.

E. Planting Pits for Shrubs/Groundcover:

1. Excavate pits and trenches with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage.
2. Loosen hard subsoil in bottom of excavation. Extend excavation as required to insure proper drainage from plant pits.
3. Fill excavated planting pits with water to half the depth of pit. Pits should drain within four hours (4 hrs). If planting pits do not drain, notify Project Inspector immediately. Do not proceed with planting until Landscape Architect has resolved a method to provide drainage.

3.4 PLANTING

A. Lawn Sod:

1. Cultivate all lawn areas to a depth of six inches (6”). If cultivation does not break lumps, pull a spike-toothed harrow over the area behind the tractor.
2. Give all lawn areas that are to be sodded a smooth finish to prevent pockets. Do not allow any abrupt changes of surface. Prior to installation of sod, roll the grade with a 200-pound water-ballast roller. Request that the lawn grade be inspected and approved by the Landscape Architect prior to sodding to determine its suitability for planting. Obtain such approval prior to commencing sodding operations.
3. Do not take heavy objects (except lawn rollers) over lawn areas after they have been prepared for planting.
4. Completely lay the sod within twelve hours (12 hrs) of delivery. Do not leave sod on pallets in the hot sun longer than necessary.
5. Unroll sod carefully. Lay sod tight without any visible open joints, and without overlapping; stagger end joints twelve inches (12”) minimum. Do not stretch or overlap sod pieces. Do not place sod in pieces smaller than twenty-four inches (24”) in length by width of roll.
6. When new sod is to match existing turf, cut the edge of the existing turf in a series of straight lines that will accept new sod rolls in full width of the sod roll. Make the transition of grade between existing turf and new sod to be seamless with no change in elevation.
7. Immediately after laying sod, roll lawn areas with a 200-pound water-ballast roller.
8. Trim sod to conform to lawn shapes designated in Drawings.
9. On slopes of six inches (6”) per foot and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at a maximum of two feet (2’) on center. Drive pegs flush with soil portion of sod.
10. Ensure that finished appearance is that of one continuous lawn.
11. Do not lay whole lawn before watering. When a conveniently large area has been sodded, water lightly to prevent drying. Continue to lay sod and to water until installation is complete.
12. All sod areas must be approved by Landscape Architect.

13. Water the complete lawn surface thoroughly. Moisten soil at least eight inches (8”) 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 as necessary.

B. Trees, Shrubs, and Groundcover:

1. Lay out individual tree and shrub locations and areas for multiple plantings. Stake the locations, outline the areas, and secure the Owner’s Representative's acceptance before beginning the planting work. Make minor adjustments as requested.
2. Scarify root ball prior to planting. Plant in holes twice the diameter of the root ball and to a depth equal to the container’s height. Place the shrub and/or groundcover so the top of the root ball is one inch (1”) higher than the surrounding grade; place the tree so that the crown of the trunk is two inches (2") higher than the surrounding grade. Set container-grown stock in center of pit. In hot weather, pre-wet the pit. When set, place additional backfill around base and sides of root ball. Work each layer to settle backfill and eliminate voids and air pockets. Thoroughly compact lower half of backfill in plant pit. See staking or guying detail. Water after planting. Provide a berm or watering basin for each tree. Add Vitamin B-1, in the proper solution as recommended by the manufacturer, to the second watering of the basin.
3. Place fertilizer planting tablets in root zone and alongside each plant. Follow manufacturer's instructions for number of tablets to use for each container size.
4. See Drawings for additional information.
5. Grooming and Staking of Trees:
    a. Prune, thin-out and shape trees in accordance with standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by Landscape Architect, do not cut tree leaders, and remove only injured or dead branches from flowering trees.
    b. Paint cuts over one-half inch (½”) in size with standard tree paint or compound, covering exposed, living tissue. Use paint that is waterproof, antiseptic, adhesive, elastic and free of kerosene, coal tar, creosote, and other substances harmful to plants. Do not use shellac.
    c. Stake or guy trees immediately after planting, as indicated on Drawings.
6. Grooming of Shrubs:
    a. Prune, thin-out and shape shrubs in accordance with standard horticultural practice. Prune shrubs to retain natural character and to accomplish their use in landscape design. The required plant size is its size after pruning.
    b. Remove and replace excessively pruned or malformed new plants resulting from improper pruning.

C. Request review by the Landscape Architect after locating, but prior to planting all trees. Under the direction of the Landscape Architect, make slight adjustments to plant material location as necessary to reflect original intention of Drawings.

3.5 WEED CONTROL

A. Apply pre-emergent weed control to all planting areas (except lawn) after completion of all planting and one complete watering. Follow manufacturer's directions. To prevent washing away of weed control, do not over-water after its application. Do not allow any weed control into lawn areas. Treat any existing noxious weeds, such as Johnson grass, with Roundup in successive treatments until all roots are destroyed, then remove all grass and roots. Notify Owner's Representative of time of installation for verification of application.

3.6 BARK MULCH

A. Apply mulch at the rate of three inches (3") deep to all planting areas, exclusive of lawn, after the planting and weed control are completed. Twelve inches (12") from planter edges, taper full depth of mulch to meet adjacent grades. Do not place mulch within three inches (3") of trunk or stems.

3.7 CLEAN-UP

A. During construction, keep the site free of rubbish and debris, and clean up the site promptly when notified to do so. Take care to prevent spillage on streets from hauling and immediately clean up any such spillage and/or debris deposited on streets due to the work of this Section.

B. During all phases of the construction work, take all precautions to abate dust nuisance by clean-up, sweeping, sprinkling with water, or other means as necessary.

C. Paving: Maintain cleanliness of paving areas and other public areas used by equipment, and immediately remove spillage; remove rubbish, debris, and other material resulting from landscaping work, leaving site in a safe and clean condition.

3.8 LANDSCAPE MAINTENANCE

A. The Landscape Maintenance Period will begin when all the Landscape Maintenance Period Requirements have been met (See Part 1 of these Specifications).

B. Cleaning: Maintain cleanliness on paving areas and other public areas used by equipment and immediately remove all spillage. Remove from project site all rubbish and debris found thereon and all material and debris resulting from landscaping work, leaving the site in a safe and clean condition.

C. Maintenance:

1. Sprinkler Irrigation System:
    a. Check system weekly for proper operation. Flush lateral lines out after removing last sprinkler head or two at each end of lateral. Adjust all heads as necessary for unimpeded coverage.
    b. Set and program automatic controllers for seasonal water requirements. Provide the Owner's Representative with keys to the controllers and instructions on how to turn off system in case of emergency.

c. Repair all damages to sprinkler irrigation system as part of the contract work. Make repairs within one watering period or one week, whichever is the least amount of time.

2. Turf Areas:
   a. Begin mowing turf when grass has reached a height of three inches (3") and cut to a height of one-half inches to two inches (1 ½" - 2"). Mow at least weekly after the first cut. Turf must be well-established and free of bare spots and weeds, to satisfaction of Landscape Architect, prior to final acceptance. Do not mow lawns when the soil is not able to support maintenance equipment. Repair wheel marks and ruts caused by the maintenance equipment at no additional cost to the Owner.
   b. Pick up grass clippings and remove from the site and premises.
   c. Trim edges at least twice monthly for neat appearance. Vacuum or blow clippings off walks.
   d. Water the lawns at such frequency as weather conditions require to replenish soil moisture below the root zone. Normally, a total of one and one-half inches (1 ½") of water is needed weekly in hot weather.
   e. Fertilize the lawn areas at the beginning of the Landscape Maintenance Period and at the completion of the Landscape Maintenance Period. Use a fertilizer with the following characteristics:
      1) Slow release, Best 16-6-8, or approved equal, at the rate of 6.25 lbs per 1,000 square feet from March through October.
      2) Calcium Nitrate (15-0-0) at the rate of 6.5 lbs per 1,000 square feet from November through February.
   f. Broadcast fertilizer using a mechanical spreader; do not apply by hand-broadcasting. Sweep all fertilizer off hardscape into adjacent planters.
   g. Weekly as needed and as directed, re-sod lawn areas with material that matches previously installed material. Use sod to repair any bare areas. Repair areas to receive sod as follows:
      1) Mark out areas to receive new sod repair.
      2) Cut straight lines that will accept sod the full width of the roll and a minimum of twenty-four inches (24") in length.
      3) Transition the grade between existing turf and new sod seamlessly, with no change in elevation.
3. Trees and Shrubs:
   a. Water enough that moisture penetrates throughout root zone and only as frequently as necessary to maintain healthy growth.
   b. Construct and/or remove water basins around each plant, depending on the time of the year and as directed.
   c. Do not prune unless directed by the Landscape Architect.
   d. Re-stake and re-tie trees as needed and as directed by the Landscape Architect. Do not allow tops of tree stakes to protrude into head of tree.
   e. Replace any dead, dying or vandalized plant material on a weekly basis throughout the Landscape Maintenance Period.
4. Insecticide and Herbicide Application:

a. If needed, control weeds with selective herbicides and sprays. In areas where crabgrass has infested the lawn, apply pre-emergent herbicides such as Dacthal by Amvac, Balan, or Betasan by Gowan for control prior to crabgrass germination. Control insect pests if necessary.

b. Use only a licensed Pest Control Operator to apply herbicides and sprays and to maintain a log for applications indicating material, timing, and rate.

D. Final Acceptance of the Landscape Maintenance Period: request on-site meeting forty-eight hours (48 hrs.) in advance with the Landscape Architect and Owner's Representative to determine the end of the Landscape Maintenance Period.

END OF SECTION

SECTION 33 40 00

STORM DRAINING UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Summary Includes:

1. Storm drainage piping systems.

1.2 RELATED REQUIREMENTS

A. Section 01 5000, Construction Facilities and Controls.

B. Section 01 6116, Volatile Organic Compound (VOC) Restrictions, for VOC limits pertaining to adhesives, sealants, fillers, primers, and coatings.

C. Section 01 8113, Sustainable Design Requirements, for CAL-Green **[and Collaborative for High Performance Schools (CHPS)]** general requirements and procedures.

D. Section 31 0000, Earthwork.

E. Section 31 2333, Trenching and Backfilling.

F. Section 32 1200, Asphalt Concrete Paving.

G. Section 32 1600, Site Concrete

1.3 REFERENCES AND STANDARDS

A. California Building Code (CBC), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

B. California Green Building Standards Code (CAL Green), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

C. California Plumbing Code, (CPC), edition as noted on the Drawings.

D. Local Jurisdiction: Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.

E. ASTM International (ASTM):

1. D 422-63 Test Method for Particle Size Analysis of Soil.
2. D698-00 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
3. D1556-00 - Test Method for Density of Soil in Place by the Sand-Cone Method.
4. D1557-02 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

5. D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).
6. D 4318-05 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.

F. CALTRANS Standard Specifications.

G. CAL-OSHA, Title 8, Section 1590 (e).

1.4 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:

1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.
3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements.

1.5 ACTION SUBMITTALS

A. Provide supplier's descriptive literature for all products to demonstrate compliance with specified attributes.

B. Substitution: Provide all data of proposed material being submitted as a substitution. Provide comparison with specified product data and identify all differences. Failure to provide comparison will be reason for rejection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: Contractor / installer.

B. Provide sieve analysis from accredited testing lab on pipe bedding material. Analysis shall have a current date not older than project contract signing date.

C. Sustainable Design:

1. General:
   a. Submit information necessary to establish and document compliance with the California Green Building Standards Code.
   b. Sustainable design submittals are in addition to other submittals.
2. The following information shall be provided:
   a. Adhesives and Sealants: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.
   b. Paints and Coatings: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.

1.7 CLOSEOUT SUBMITTALS

A. Guarantee: Submit subcontractor's guarantee.

1.8 QUALITY ASSURANCE

A. Contractor / Installer shall have been in business for five (5) years providing/finishing similar size projects and complexity.

B. Contractor shall be solely responsible for all subgrades built. Any repairs resulting from inadequate compaction are the responsibility of the contractor.

C. The representatives of the Owner's testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner's testing lab representatives nor the testing by the Owner's testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting inadequate compaction is the sole responsibility of the contractor.

D. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.

1. Sun damaged or discolored PVC pipe will be rejected.

E. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Project Inspector. Work not so inspected is subject to uncovering and replacement.

1.9 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle in strict accord with the local jurisdiction and manufacturer's written recommendations

B. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

1.10 EXISTING SITE CONDITIONS

A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

B. Existing civil, mechanical and electrical improvements are shown on respective site plans to the extent known. Should the Contractor encounter any deviation between actual conditions and those shown, he is to immediately notify the Architect before continuing work.

1.11 PROTECTION

A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.

B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

C. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

D. Provide shoring, sheeting, sheet piles and/or bracing to prevent caving, erosion or gullying of sides of excavation.

E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to provide pumps and all equipment necessary to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.

F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.

H. Trees: Carefully protect existing trees that are to remain.

1.12 SEASONAL LIMITS

A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

1.13 TESTING

A. General: Refer to Section 01 4523 – Testing and Inspection Services, and Structural Tests and Inspections List, DSA-103.

B. Geotechnical Engineer: Owner is retaining a Geotechnical Engineer to determine compliance of fill with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will be borne by Owner; except those costs incurred for re-tests or re-inspection will be paid by Owner and backcharged to Contractor.

1.14 RECORD DRAWINGS

A. Keep a daily record of all pipe placed in ground, verified by Project Inspector.

B. Upon completion of this Contract, furnish one tracing showing all outside utility lines, piping, etc., installed under this Contract. Locate and dimension all work with reference to permanent landmarks.

C. All symbols and designations used in preparing "RECORD" drawings shall match those used in Contract drawings.

D. Properly identify all stubs for future connections, as to location and use, by setting of concrete marker at finished grade in the manner suitable to Architect.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Sustainable Design:

1. VOC emissions for field-applied adhesives, sealants, and sealant primers must comply with limits specified in Section 01 6116.
2. VOC emissions for field-applied paints and coatings must comply with limits specified in Section 01 6116.

2.2 MATERIALS

A. Pipe: Use one of the following, unless noted on the Drawings otherwise.

1. Polyvinyl Chloride Pipe (PVC): SDR35 conforming to ASTM D3034 with elastomeric joints conforming to ASTM D3212 for pipe to 12". Sun damaged pipe will be rejected.
2. High density polyethylene pipe (HDPE): The pipe shall be corrugated exterior/smooth interior pipe. 12” to 60" maximum diameter shall conform to AASHTO M294, water tight per ASTM D3212 with water tight gasket fittings.

B. Perforated Pipe (for subdrains): Shall be ADS N12 pipe, 3 hole, ASTM F 405, AASHTO M 252; PCV ASTM D3034 SDR-35 storm drain pipe

C. Manhole: Shall be as shown on the drawing details.

D. Drop Inlet: Shall be as shown on the drawing details.

E. Curb Inlet: Shall be as shown on the drawing details.

F. Mortar: For pipe connections to concrete drainage structures, conform to ASTM C270 type N mortar. Place within one half hour after adding water.

G. Crushed Rock: Imported washed crushed rock. Minimum 100% passing 3/4 inch sieve.

H. Trench drain: Polycast, Polydrain or equal and as shown on drawings.

I. Area Drains: Shall be as shown on the drawing details.

J. Floor Drains: Shall be as shown on the drawing details.

K. Clean-outs: Shall be as shown on the drawing details.

L. Planter drains: Shall be as detailed on the drawing details.

M. Filter Fabric: Mirafi 140N.

PART 3 - EXECUTION

3.1 INSPECTION LAYOUT AND PREPARATION

A. Prior to installation of the work of this Section, carefully inspect and verify by field measurements that installed work of all other trades is complete to the point were this installation may properly commence

B. Layout all work, establish grades, locate existing underground utilities, set markers and stakes, setup and maintain barricades and protection facilities; all prior to beginning actual earthwork operations. Layout and staking shall be done by a licensed Land Surveyor or Professional Civil Engineer.

C. Verify that specified items may be installed in accordance with the approved design.

D. In event of discrepancy, immediately notify Owner and the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.2 EXCAVATION AND BACKFILLING

A. General: Installation shall be in strict conformance with referenced standards, the manufacturer’s written directions, as shown on the drawings and as herein specified.

B. Verify invert elevations at points of connection to existing systems prior to any excavation. If invert elevations differ from that shown on drawings, notify Architect immediately.

C. Excavation and Bedding:

1. General: Trench straight and true to line and grade with bottom smooth and free of irregularities or rock points. Trench width in accordance with pipe manufacturer’s recommendations and as per the drawings. Follow manufacturer's recommendations for use of each kind and type of pipe.
2. Bedding: Provide bedding as detailed on plans for the full length of the pipe. Bedding shall have a minimum thickness beneath the pipe of 4" or 1/8 the outside diameter of the pipe, which ever is greater. Provide bell holes and depressions for pipe joints only of size required to properly make joint.
3. If the trenches for the site drainage fall within areas to be lime treated, the piping shall be installed prior to any lime treatment operations.
    a. If additional piping is added to previously lime treated areas, the contractor shall backfill the trench with class 2 aggregate base and compact to 95%.

D. Laying of Pipe:

1. General: Inspect pipe prior to placing. Set aside any defective or damaged material. Do not place pipe in water nor place pipe when trenches or weather are unsuitable. Lay pipe upgrade, true to line and grade.
2. Bell and Spigot Joints: Lubricate inside of bells and outside of spigots with soap solution or as recommended by manufacture. Wedge joints tight. Bell of bell and spigot pipe to be pointed upgrade.

3. Pipe shall be bedded uniformly throughout its length.
4. Pipe elevation shall be within 0.02 feet of design elevation as shown on plans.
5. Off Site Work: All work beyond the property lines shall be done in strict conformance with the requirements of the governing agency.

E. Backfilling:

1. General: Do not start backfill operations until required testing has been accomplished.
2. Trenches and Excavations: Backfill with material as detailed on plans, filling both sides of the pipe at the same time, carefully tamping to hold pipe in place without movement. Refer to Section 31 2333 – TRENCHING AND BACKFILLING for fill above this layer.

F. Grouting of Pipes: Grout pipes smooth and water tight at drop inlet, manholes, and curb inlets. Grout back side of hood at curb inlets all grouting shall be smooth and consistent.

G. Off Site Work: All work beyond the property lines shall be done in strict conformance with the requirements of the local agency.

H. Cutting and Patching: Remove and replace existing surface features per applicable specification section (i.e. asphaltic concrete or concrete paving) where pipe is installed in areas of existing improvements.

3.3 TOLERANCES

A. Storm Drain structure grates

1. In landscape and lawn areas +- 0.05'.
2. In sidewalk and asphalt pavement +-0.025'.
3. In curb and gutter application +-0.0125'.

B. Cleanout Boxes and Lids

1. In landscape areas; 0.10 higher than surrounding finish grade, +-0.05'.
2. In sidewalks and asphalt pavement; Flush with surrounding finish grade, +-0.025'.

3.4 DEWATERING

A. Contractor to provide trench dewatering as necessary, no matter what the source is, at no additional cost to the owner.

3.5 FLUSHING

A. The Contractor shall thoroughly ball and flush the storm drain system to remove all dirt and debris. Discharge water to an approved location.

3.6 CLEANING

A. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.

B. Clean the dirt, rocks, and debris from the drop inlets and storm drain manholes.

END OF SECTION