100% CONSTRUCTION DOCUMENTS

Spring Lake Elementary School

2209 Miekle Avenue, Woodland, CA 95776

HMC #3535003-108
DSA App #02-120683
File #57-37

Woodland Joint Unified School District
435 6th Street, Woodland, CA 95695

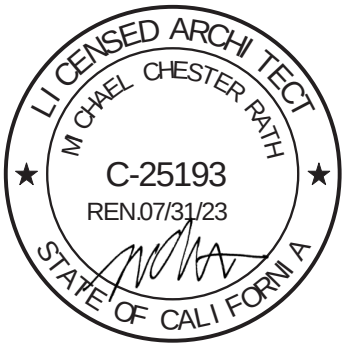
December 6, 2022

HMC Architects

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 02-120683 INC:
REVIEWED FOR
SS ☐ FLS ☐ ACS ☑
DATE: 12/06/2022

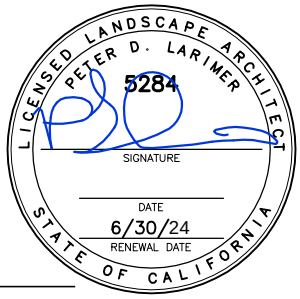
Spring Lake Elementary School Playfields
Woodland Joint Unified School District Woodland, CA

December 6, 2022
HMC # 3535003-108
DSA App #02-120683
File #57-37



HMC Architects
Architect

Warren Consulting Engineers
Civil Engineer



MTW Group
Landscape Engineer

HMC Architects

SECTION 00 01 10

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SECTION 31 00 00

EARTHWORK

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 50 00, Construction Facilities and Temporary Controls.

B. Section 31 23 33, Trenching and Backfilling.

C. Section 32 12 00, Asphalt Concrete Paving.

D. Section 32 16 00, Site Concrete.

E. Section 32 80 00, Irrigation.

F. Section 32 90 00, Landscaping.

G. Section 33 40 00, Site Drainage.

1.03 QUALITY ASSURANCE

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

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

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. Tests (See Part 3 for Compaction Testing).

E. 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.

1.04 SUBMITTALS

A. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

1.05 WARRANTY

A. Refer to General Conditions.

1.06 REFERENCES AND STANDARDS

A. General: Site survey, included in the drawings, was prepared by Warren Consulting Engineers, Inc., 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.

B. Geotechnical Engineering Report was prepared by Youngdahl Consulting Group, Inc. Report is entitled Geotechnical Engineering Study Update for Spring Lake Elementary School, and is on file with Architect. Recommendations of the Goetechnical report were used to develop the contract plans and specifications. The Geotechnical report shall be used as a reference for the soil condition of the project site. The design information contained in the contract plans and specifications shall govern over the recommendation of the Geotechnical report.

C. 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.

D. ANSI/ASTM D698-e1 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

E. ANSI/ASTM D1556-e1 - Test Method for Density of Soil in Place by the Sand-Cone Method.

F. ANSI/ASTM 698-12e2 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

G. ANSI/ASTM D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).

H. ANSI/ASTM D 4318-10e1 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.

I. CALTRANS Standard Specifications Section 17.

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

K. 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.

1.07 DELIVERY, STORAGE AND HANDLING

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

B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 PROJECT CONDITIONS

A. 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.

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

1.09 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.

1.11 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 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.

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.

B. Excessively wet fill material shall be bladed and aerated per section 3.08, B.

1.13 TESTING

A. General: Refer to Section 014500 – Quality Requirements.

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 back charged 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.

1.14 ARCHEOLOGICAL AND CULTURAL RESOURCES

A. If archeological or cultural resources are discovered during the Work, the Contractor must cease all construction operations in the vicinity of the discovery until a qualified archeologist can assess the value of these resources and make recommendations to the State Historic Preservation Officer. Archeological and cultural resources include artifacts, large amounts of bone, shell, or flaked stone, and other evidence of human activity. If the State Historic Preservation Officer or the Owner directs that work be temporarily ceased at the location of an archeological or cultural find, the Contractor must temporarily suspend work at the location.

PART 2 - PRODUCTS

2.01 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 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 12 inches of any fill.

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 12 or less; an R-value of equal to or greater than 30; have no more than 15 percent passing through the No. 200 sieve; be free of particles greater than 6-inches 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 the 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.
   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.

3. Frequency of testing shall be conducted in accordance with DTSC's Imported Fill Advisory as follows;

   Fill Material Sampling 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

4. 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. Imported Topsoil may be required to complete work. See Section 32 90 00 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 reddish-tan to tan in color.

G. Decomposed Granite Solidifier: PolyPavement or equal.

PART 3 – EXECUTION

3.01 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 where 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.

3.02 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.

3.03 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 12", moisture-conditioned to 4% above optimum moisture content, and recompacted to at least 90% of the maximum dry density.

3.04 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.

3.05 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 3.07, 3.08, 3.09, 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. Stripping's meeting the requirements of Section 32 90 00 may be used in landscape areas only.

3.06 CUTTING

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

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

C. 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.

3.07 FOOTING EXCAVATION

A. 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.

B. Unsuitable Ground: Any errors in 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 90% of dry density.

3.08 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 18", until surface is free from ruts, hummocks or other uneven features and uniform and free from large clods. Moisture condition to 4% above optimum moisture content and recompact to at least 90% 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 disking 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. Subgrade in areas to receive landscaping shall be compacted to 90%.

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

3.09 PLACING, SPREADING AND COMPACTING FILL MATERIAL IN PAVEMENT AREAS

A. Engineered Fill material shall be placed in layers which, when compacted, shall not exceed 12 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.

C. 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 4% above optimum moisture content, and compact to a minimum of 90% relative compaction in building pad and paved areas, and to 90% relative compaction in landscape areas.

D. Jetting of fill materials will not be allowed.

3.10 FINAL SUBGRADE COMPACTION

A. Pavement areas: Upper 12" 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 18” 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. After subgrade under landscape area has been scarified and brought to 90% maximum dry density, top soil shall be placed per Landscape specifications and compacted to 85% of maximum dry density.

3.12 DECOMPOSED GRANITE COMPACTION AND STABILIZATION

A. Decomposed granite paving, paths or track shall be placed uniformly to the required depth and treated with PolyPavement or approved equal. Apply PolyPavement using Application Method 1 or a mixed application method.

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 32

90 00.

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. 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

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The general conditions, supplementary conditions and Division 1 are fully applicable to this section as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 50 00, Construction Facilities and Temporary Controls.

B. Section 31 00 00, Earthwork.

C. Section 33 40 00, Site Drainage.

D. Section 32 80 00, Irrigation.

E. Section 321200, Asphalt Concrete Paving

1.03 QUALITY ASSURANCE

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

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

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

1.04 SUBMITTALS

A. Submit Manufacturers data and shop drawings.

1.05 WARRANTY

A. Submit fully executed warranty for work and materials in this section per 01 78 36.

1.06 REFERENCES AND STANDARDS

A. California Building Code current edition.

B. California Plumbing Code current edition.

1.07 DELIVERY, STORAGE AND HANDLING

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

B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 PROJECT CONDITIONS

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. Field verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.

C. 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.

1.09 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.

1.10 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.

1.11 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 310000, 3.08, B.

1.12 TESTING

A. General: Refer to Section 01 45 00 – Quality Requirements.

PART 2 – PRODUCTS

2.01 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 3-inches.
   3. Sand: Fine granular material, free of organic matter, mica, loam or clay.
   4. Lean Mix Concrete/Controlled Density Backfill: 2 sacks cement slurry.
   5. Class 2 aggregate base, ¾” rock, per Caltrans section 26-1.02B

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 31 00 00, Section 33 40 00.

PART 3 – EXECUTION

3.01 INSPECTION

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.

3.02 COORDINATION

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

3.03 INSTALLATION

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

3.04 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 trench through existing pavement saw cut existing pavement in straight lines. 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 asphalt. Replace asphalt and concrete pavement sections to matched existing conditions. In concrete pavement provide expansion and control joints to match existing joint layout.

3.05 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 00 00, 3.08, B.
   3. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to 90% of maximum dry density while at specified moisture content. Compact each layer over its entire area until desired density has been obtained.
   4. The top 18 inches of subgrade compaction under pavement shall be per Earthwork section 31 00 00.
   5. 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. If trenching is necessary in areas that have been previously lime treated the contractor shall backfill the trench with class 2 aggregate base, with minimum section equal to the lime treated section and compacted to 95%.

3.06 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.

3.07 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 cut neatly and replaced with new materials.

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

3.08 SURPLUS MATERIAL

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

3.09 CLEANING

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 32 12 00

ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 50 00, Construction Facilities and Temporary Controls.

B. Section 31 00 00, Earthwork.

C. Section 31 23 33, Trenching and Backfilling.

D. Section 32 80 00, Irrigation

E. Section 33 40 00, Site Drainage.

1.03 QUALITY ASSURANCE

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

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

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

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

F. Sieve analysis from testing laboratories identifying rock/sand percentages within the asphalt mix shall have a testing date within 90 days of contract signing.

G. Sieve analysis from a testing laboratory identifying rock/sand percentages within the class 2 aggregate base rock shall have a testing date within 90 days of contract signing.

1.04 SUBMITTALS

A. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

1.05 WARRANTY

A. Refer to General Conditions.

1.06 REFERENCES AND STANDARDS

A. ANSI/ASTM 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.

B. ANSI/ASTM D1556-00 - Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ANSI/ASTM 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.

D. ANSI/ASTM D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).

E. ANSI/ASTM 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).

H. 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.

1.07 DELIVERY, STORAGE AND HANDLING

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

B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 PROJECT 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.

1.09 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.

1.10 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.

1.11 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.

1.12 TESTING

A. 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

2.01 MATERIALS

A. Sterilant: Soil sterilizer shall be CIBA GEIGY's Pramatol 25-E 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 WMA per Caltrans approved list of manufacturer's.

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 grading.

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. "OverKote", Reed and Gram.
   3. "Drivewalk", Conoco Oil.

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

2.02 MIXES

A. General: Plant mixed conforming to State Specifications, Section 39, Type B, 3/8" maximum, medium grading.

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

3.01 EXAMINATION OF CONDITIONS

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.

3.02 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 310000. 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.

B. Cleaning: Existing surfaces and new surface shall be clean of all dirt, sand, oil or grease. All cracks shall be cleaned and free of all debris and vegetation. Hose down entire area with a strong jet of water to remove all debris.

3.03 INSTALLATION

A. 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. Onsite inspector shall verify temperature of asphalt upon truck arrival to the site.

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 2, 15 and 16.

B. Seal Coat:
1. Seal coat shall be applied no sooner than 30 days from time of asphalt placement, no exceptions.
2. Surface Preparation: surface and cracks shall be clean of all dirt, sand, oil or grease. All cracks shall be filled to a level condition after curing. Make multiple fill applications until a level condition is achieved. Failure to do so will be the reason for rejection. 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 hot mix 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.
3. Seal Coat Seal Application: Thoroughly mix materials and apply 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.

3.04 DEFECTIVE ASPHALT;
Defective asphalt is as described below.

A. Exposed rock pockets on the finished surface that lack the # 8- #200 fines that is required per the sieve analysis.

B. Asphalt not placed to the design grades.

C. Asphalt that ponds water.

D. Asphalt that was compacted below the minimum required temperature and is cracked.

E. Asphalt that fails to meet the minimum compaction requirements.

F. Asphalt that lacks the minimum thickness required per plan.

G. New asphalt contaminated by a petroleum product, or spilled paint.

H. Asphalt that has depressions, cracks, scored divits from dumpster wheels, heavy equipment use, heavy construction products,

I. Asphalt placed on pumping, unstable sub-grades.

3.05 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

1.01 SECTION INCLUDES

A. The Section describes the requirements for providing portland cement concrete paving, including accessibility ramps, sidewalks, accessible routes of travel, vehicular travel, drain structures, sewer structures, thrust blocks and for other non-structural or non-vehicular applications.

1.02 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 45 00, Testing Lab Services.

B. Section 31 00 00, Earthwork.

1.04 QUALITY ASSURANCE

A. Use only new materials and products.

B. Use materials and products of one manufacturer whenever possible.

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

D. 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

1.05 SUBMITTALS

A. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

B. Materials list: Submit to the Architect a complete list of all materials proposed to be used in this portion of the work. Submitted items should include but are not limited to sand, gravel, admixtures, surface treatments, coloring agents, sealers, fibers, cast-in-place accessories, forming and curing products and concrete mix designs.

C. With concrete submittal, provide documented history of mix design performance.

1.06 WARRANTY

A. Refer to General Conditions.

1.07 REFERENCES AND STANDARDS

A. California Building Code, latest edition.

B. ACI Standards, ACI 211.1, ACI 318-14, ACI 302, IR-04, ACI 301-16, ACI 305R-10, ACI 306R-16, ACI 308-16.

C. ASTM C-94, Specification for Ready-Mixed Concrete.

D. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice (latest edition).

E. ASTM – American Society for Testing and Materials.

1.08 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 accord with the manufacturer's written recommendations.

D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

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

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

1.09 TESTING

A. General: Refer to Section 01 40 00 – Quality Requirements.

1.10 ADEQUACY AND INSPECTION

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

B. Notify Inspector, Architect and DSA at least 48 hours prior to placing of concrete.

1.11 PROTECTION

A. Finish surfaces shall be protected at all times from concrete pour. Inspect forming against such work and establish tight leak-proof seal before concrete is poured. Finish work damaged, defaced or vandalized during the course of construction shall be replaced by contractor at contractor expense.

1.12 FIELD MEASUREMENTS

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

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement: Portland cement, ASTM C150, Type II, per ACI 318-14 Section 26.4.

B. Concrete Aggregates: Normal weight aggregates shall conform to ASTM C33, except as modified by this section. Combined grading shall meet limits of ASTM C33. Lightweight aggregate shall conform to ASTM C330, suitably processed, washed and screened, and shall consist of durable particles without adherent coatings.

C. Water: Clean and free from deleterious amounts of acids, alkalis, scale, or organic materials and per ACI 318-14 Section 26.4.1.3.1.

D. Fly Ash: Western Fly Ash, conforming to ASTM C618 for Class N or Class F materials (Class C is not permitted). Not more than 15% (by mass) may be substituted for portland cement.

E. Water Reducing Admixture: Admixture to improve placing, reduce water cement ratio, and ultimate shrinkage may be used. Provide WRDA 64 by Grace Construction Products or approved equal. Admixture shall conform to ASTM C494 and ACI 318-14 Section 26.4.1.4.19(a). Such admixture must receive prior approval by the Architect, Structural Engineer, and the Testing Lab, and shall be included in original design mix.

F. Air-entraining Admixture: Daravair 1000 by Grace Construction Products or approved equal. Admixture must conform to ASTM C260 and ACI 318-14, section 26.4.1.4.

G. Surface Retarder (for exposed aggregate finishes): Rugasol-S by Sika Corporation or approved equal.

H. Form Coating: Material which will leave no residue on concrete surface that will interfere with surface coating, as approved by the Architect.

I. Reinforcement Bars: New billet steel deformed bars conforming to requirements of ASTM A615 or ASTM A706; Grade 60. Dowels for installation through expansion joints or construction joints to existing sidewalks or concrete features shall be smooth or shall be sleeved on one end for slippage.

J. Reinforcing supports: Galvanized metal chairs or spacers or metal hangers, accurately placed 3’-0” O.C.E.W. Staggered and each support securely fastened to steel reinforcement in place. Bottom bars in footings may be supported with 3” concrete blocks

with embedded wire ties. Concrete supports without wire ties will not be allowed.

K. Curing Compound (for exterior slabs only): Burke Aqua Resin Cure by Burke by Edoco, 1100 Clear by W.R. Meadows or accepted equal. Water based membrane-forming concrete curing compound meeting ASTM C 309 and C1315.

L. Concrete Bonding Agent: Weld-Crete by Larson Products Corp., Daraweld C by Grace Construction Products or accepted equal.

M. Patching Mortar: Meadow-Crete GPS, one-component, trowel applied, polymer enhanced, shrinkage-compensated, fiber reinforced, cementitious repair mortar for horizontal, vertical and overhead applications as manufactured by W.R. Meadows or accepted equal.

N. Non-shrink Grout: Masterflow 713 Plus by Master Builders or approved equal. Premixed,non-metallic, no chlorides, non-staining and non-shrinking per CRD-C621, Corps of Engineers Specification and ASTM C 1107, Grades B and C.

O. Aggregate Base: Class 2 AB per Caltrans specification section 26-1.02A.

P. Expansion Joint Material: Preformed 3/8" fiber material, full depth of concrete section, with bituminous binder manufactured for use as concrete expansion joint material, as accepted by the Architect.

Q. Joint sealant for expansion joints: Single component silicone sealant, Type S, ASTM D5893.
   1. Reference Standard: ASTM C920, Grade P, Class 25, Use T.
   2. Dow Corning 890-SL (self-leveling) Silicone, or accepted equal.
   3. Dow Corning 888-NS (non-sagging) Silicone, at slopes exceeding 5%. May not be used at asphalt surfaces.
   4. Color: Custom color as selected by Architect.

R. Pre- Formed plastic Expansion Joint; W.R. Meadows 3/8” “Snap Cap”, Tex-Trude expansion joint cap, or an approved equal.

S. Adhesive Anchoring (Epoxy): Hilty HIT-HY 200 Safe Set, or approved equal.

2.02 CONCRETE DESIGN AND CLASS

A. Class “B”: Concrete shall have 1" max. size aggregate, shall have 3000 psi min. at 28 day strength with a maximum water to cementitious ratio no greater than 0.50. Use for exterior slabs, including walks, vehicular paved surfaces, manhole bases, poured-in-place drop inlets, curbs, valley gutters, curb & gutter and other concrete of like nature.

B. Slump Limits: Provide concrete, at point of final discharge, of proper consistency determined by Test Method ASTM C143 with a slumps of 4" plus or minus 1".

C. Mix Design: All concrete used in this work will be designed for strength in accordance with provisions of ASI 318-14 Section 26.4. Should the Contractor desire to pump concrete, a modified mix design will need to be submitted for review. Fly ash may be used in concrete to improve workability in amounts up to 15% of the total cementitious weight.

D. Air Entrainment; Per the Local Jurisdiction minimum requirements, or 3% minimum.

2.03 MIXING OF CONCRETE

A. Conform to requirements of CBC, Chapter 19A.

B. All 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 and ACI 301.
   1. 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.
   2. Water may be added to the mix only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded. In no case shall more than 10 gallons of water shall be added to a full 9 yard load, or 1 gal. per yard on remaining concrete within the drum providing load tag indicates at time of mixing at plant will allow for additional water.

2.04 MATERIALS TESTING

A. Testing of concrete shall be performed per article 3.12 of this specification.

2.05 EQUIPMENT

A. Handling and mixing of concrete: Project Inspector may order removal of any equipment which in his opinion is insufficient or in any way unsuitable.

PART 3 - EXECUTION

3.01 APPROVAL OF FORMS AND REINFORCEMENTS

A. Forms and reinforcements are subject to approval by the Project Inspector 48 hours prior to placement of concrete. Before placing concrete, clean tools, equipment and remove all debris from areas to receive concrete. Clean all reinforcing and other embedded items off all coatings oil, and mud that may impair bond with concrete.

B. All reinforcing steel shall be adequately supported by approved devices on centers close enough to prevent any sagging.

C. All reinforcing bar lap splices shall be staggered a minimum of 5 ft.

D. 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 ½” clearance and a maximum of 3” clearance. The reinforcing steel shall be placed mid-depth of concrete slab.

E. At all right angles or intersections of concrete walks, additional 2'x2' #5, 90 degree bars shall be added at all inside corners for additional crack control. The bars shall be placed 2" from concrete forms and supports at mid-depth of slab.

3.02 PROTECTION

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

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

C. Sub-Grade in concrete paved areas: Subgrade shall be clean, shaped and compact to hard surface free from elevations or depressions exceeding 0.05' in 10' from true plan. Compact per Section 31 00 00. Compaction and moisture content shall be verified immediately prior to placement of concrete. Proof roll subbase in presence of geotechnical engineer prior to placement of aggregate base.

3.03 CLEANING

A. Reinforcement and all other embedded items at time of placing concrete to be free of rust, dirt oil or any other coatings that would impair bond to concrete.

B. Remove all 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.

3.04 FORMING

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 form work 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. Slope tie-wires downward to outside of wall.

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

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

I. Concrete paving:
1. Expansion Joints: Install at locations indicated, and so that maximum distance between joints is 20' for exterior concrete unless otherwise shown. Expansion joint material shall be full depth of concrete section. Recess for backer rod and sealant where required. Expansion joints shall not exceed ¼ inch depth measured from finish surface to top of felt or sealant, and ½ inch width.
2. Isolation Joints: 3/8" felt between walls and exterior slabs or walks so that paved areas are isolated from all vertical features, unless specifically noted otherwise on plans.
3. Exterior Concrete Paving: Install expansion joints at 20' on center maximum, both directions, unless shown otherwise on plans.

3.05 FORM COATING

A. 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.

B. Before re-using form material, inspect, clean thoroughly and recoat.

C. Seal all cut edges.

3.06 INSTALLATION

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

B. Placing Tolerances:
1. Per 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", the maximum bar diameter not 1 ½ times the maximum size of coarse aggregate.

C. Splices:
1. General: Unless otherwise shown on drawings, splice top reinforcing at midspan between supports, splice bottom reinforcing at supports and stagger splices at adjacent splices 5 foot minimum. Bar laps shall be wired together. Reinforcing steel laps shall be as follows:
a. Lap splices in concrete: Lap splice lengths shall not be less than 62 bar diameter for No. 5 bar, 56" minimum for No. 6 bars. No. 4 bar shall have a

minimum of 24” splice. 93 bar diameters for No. 7 bars and larger.

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

3.07 INSPECTION

A. Approval of reinforcing steel, after installation, must be received from Inspector.

B. Slope of concrete forms and finish condition shall be checked with a two foot (2’) digital level.

3.08 PLACING OF CONCRETE

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 the owner.

B. 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.

C. 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.

D. Remove form spreaders as placing of concrete progresses.

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

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

G. Compacting: All concrete shall be compacted by mechanical vibrators. Concrete shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms. Vibrating shall not be applied to concrete which has already begun to initially set nor shall it be continued so long as to cause segregation of materials.

H. Concrete Flatwork:
   1. All flatwork shall be formed and finished to required line and grades. Flatwork shall be true and flat with a maximum tolerance of 1/8" in 10’ for flatness. Flatwork which is not flat and are outside of the maximum specified tolerances shall be made level by the Contractor at no additional expense to the Owner.
   2. Concrete vibrator shall be used to assist concrete placement. Contractor shall have spare concrete vibrator on site during concrete placement.
   3. Thoroughly water and soak the exterior slabs, curbs, curb and gutters, footing subgrades with multiple daily waterings for at least three (3) days or as required to achieve required moisture content prior to the concrete pour in order to place the

subgrade soils in full expansion. 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. Remove any standing water before concrete placement.

I. Placing in hot weather: Comply with ACI 305R-10. Concrete shall not exceed 85 degrees F at time of placement. Concrete shall be delivered, placed and finished in a sufficiently short period of time to avoid surface dry checking. Concrete shall be kept wet continuously after tempering until implementation of curing compound procedure in accordance with this specification.

J. Placing in cold weather: Comply with ACI 306R-16. Protect from frost or freezing. No antifreeze admixtures are permitted. When deposited concrete during freezing or near-freezing weather, mix shall have temperature of at least 50 degrees F but not more than 90 degrees F. 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. Provide necessary thermal coverings for any flat work exposed to freezing temperatures.

K. Horizontal construction joint: 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. If contact surface becomes contaminated with soil, sawdust or other foreign matter, clean entire surface and re-chip entire surface to assure proper adhesion.

3.09 CONCRETE FINISHES

A. Concrete Slab Finishing: Finish slab as required by ACI 302.1R. Use manual screeds, vibrating screeds to place concrete level and smooth. 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. Surface shall be free from trowel marks, depressions, ridges or other blemishes. Tolerance for flatness shall be 1/8" in 10'. Provide final finish as follows:
   1. Flatwork, medium broom finish: Typical finish to be used at all exterior walks and stairs.
   2. Under no circumstances can water be added to the top surface of freshly placed concrete.

B. Curb Finishing: Steel trowel.

C. Joints and Edges: Mark-off exposed joints, where indicated, with ¼” radius x 1” deep jointer or edging tool. Joints to be clean, cut straight, parallel or square with respect to concrete walk edge. Tool all edges of exposed expansion and contraction joints, walk edges, and wherever concrete walk adjoins other material or vertical surfaces.
   1. The expansion joints shall be full depth as shown in the plan details. Failure to do so will result in non-compliance and shall be immediately machine cut by the contractor at his expense.

D. Exposed Concrete Surface Finishing (not including top surface of flatwork): 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. Tie wires are to be removed to below exposed surface and

holes pointed up with neat cement paste similar to procedure noted under "Patching" below. Removal of tie wires shall extend to distance of 2" below established grade lines. Ends of tie wires shall be cut off flush at all other, unexposed locations. Care shall be taken to match adjacent finishes of exposed concrete surface. After patching, all 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. 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. 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. Entire finishing operation of any area shall be completed on the same day. This treatment shall be carried to 4" below grade, and all patching and sacking shall be done immediately upon removal of the forms.

3.10 CURING

A. Cured Concrete in Forms: Keep forms and top on concrete between forms continuously wet until removal of forms, 7 days minimum. Maintain exposed concrete in a continuous wet condition for 14 days following removal of forms.

B. Flatwork/Variable Height Curbs, Curb and gutter, Valley Gutter: Cure utilizing Curing Compound. If applicable, the Contractor shall verify that the approved Curing Compound is compatible with the approved colorant system. Upon completion of job, wash clean per manufacturer’s recommendations.
   1. 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, run ways, etc.

3.11 DEFECTIVE CONCRETE

A. Determination of defective concrete shall be made by the Architect or Engineer. His opinion shall be final in identifying areas to be replaced, repaired or patched.

B. The Owner reserves the right to survey the flatwork, if it is determined to be outside of the maximum tolerance for flatness. If the flatwork is found to be out of tolerance, then the Contractor will be required to replace concrete. The Contractor will be responsible for reimbursing the Owner for any surveying costs incurred. Determination of flatwork flatness, surveying and any 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.

C. As directed by Architect, cut out and replace defective concrete. All defective concrete shall be removed from the site. No patching is to be done until surfaces have been examined by Architect and permission to begin patching has been provided.

D. Permission to patch any 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.

E. 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.
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. Excessive Shrinkage, Traverse cracking, Crazing, Curling; or Defective Finish. Remove and replace if repair to an acceptable condition is not feasible.
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. Expansion joint felt that is not isolating the full depth of the concrete section, and 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. Control joints (weakened planed joints) that do not meet the required minimum depth shown on the drawings.

3.12 CONCRETE TESTING

A. Comply with CBC Section 1903A, 1905A.1.16, 1910A and 1705A.3 and as specified in B. below. Costs of tests will be borne by the Owner.

B. 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. 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.

C. Strength tests will be conducted by the Testing Lab on one cylinder at seven (7) days and two cylinders at twenty-eight (28) days. The fourth remaining cylinder will be available for testing at fifty-six (56) days if the 28-day cylinder test results do not meet the required design strength.

D. On a given project, if the total volume of concrete is such that the frequency of testing required by paragraph B. above 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.

E. Cost of retests and coring due to low strength or defective concrete will be paid by Owner and back-charged to the Contractor.

F. Each truck shall be tested for slump before concrete is placed.

3.13 REMOVAL OF FORMS

A. Remove without damage to concrete surfaces.

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

C. 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.

3.14 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 all concrete surfaces to remove stains, dried mud, tire marks, and rust spots.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fence framework, fabric, and accessories.

B. Excavation for post footings.

C. Concrete anchorage for center drop for gates.

D. Swing, utility and pedestrian gates, signs and related hardware.
   1. Manual.

E. Related Sections:
   1. Division 32 for Concrete footings.

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. ADA - Americans with Disabilities Act of 1990 as amended
   1. Standards - ADA Title II Regulations and the 2010 ADA Standards for Accessible Design

C. ASTM International:
   1. ASTM A 392 - Zinc-Coated Steel Chain-Link Fence Fabric.
   2. ASTM A 824 - Metallic-Coated Steel Marcelled Tension Wire for Use With Chain Link Fence.
   3. ASTM B221/B221M Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   4. ASTM F 552 - Terminology Relating to Chain Link Fencing.
   5. ASTM F 567 - Installation of Chain-Link Fence.
   6. ASTM F 626 - Fence Fittings.
   7. ASTM F 900 - Industrial and Commercial Swing Gates.
   8. ASTM F 1043 - Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework.
   9. ASTM F 1083 - Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
   10. ASTM F 1184 - Industrial and Commercial Horizontal Slide Gates.
   11. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. SSPWC - Standard Specifications for Public Works Construction, Latest Edition

E. CLFMI - Chain Link Fence Manufacturer's Institute

F. CBC - 2019 California Building Code
1. Chapter 10, Means of Egress.
2. Chapter 11B, Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.
3. Chapter 19A, Concrete.

G. National Ornamental and Miscellaneous Metals Association (NOMMA)
1. NOMMA Guidelines - Guideline 1 Joint Finishes

1.03 SUBMITTALS

A. Product data: on each specified product and accessory.

B. Shop Drawings: including plan layout, grid, spacing of components, accessories, fittings, hardware, footings, anchorages and schedule of components.

C. Certifications: Manufacturer's material certifications in compliance with current ASTM specifications.

D. Manufacturer's installation instructions.

E. Three samples illustrating each fence fabric finish.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in commercial quality chain link fencing with five years' experience.

B. Installer: Demonstrated successful experience installing chain link fencing on similar projects in accordance with ASTM F567 and have at least 5 years' experience.

1.05 WARRANTY

A. Provide two-year warranty to insure materials against rusting or breakdown of finish. Provide adjustments as needed to assure continued smooth operation of gates.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products of the following manufacturers form basis-for-design and quality intended:
1. Any Manufacturer who is a current member of the Chain Link Fence Manufacturer's Institute.
2. Or equal as approved in accordance with Division 01, General Requirements for substitutions.

2.02 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.

2.03 MATERIALS

A. Framework: ASTM F1043; Type I Group IA. ASTM F1083; Schedule 40 , Intermediate Strength Grade 50,000 psi, hot-dipped galvanized steel pipe, minimum 1.8 oz/sq.ft., . Sized in accordance with Table 206-6.2, Standard Specifications for Public Works Construction, and as listed below. One piece without joints in accordance with CLFM I.
   1. EXIT Gates: galvanized square tube, ASTM A500, Grade B, for square pipe at lintels and gate posts, minimum galvanizing coating of 1.8 ounces per sq. ft. 2-1/2 inches square.

B. Fabric: Type II ASTM A817, Class 2 ASTM A392, Class 2 (not less than 2 oz/ft sq.), galvanized before (G.B.W.) weaving, 2-inch mesh, 9 gauge, interwoven, top and bottom knuckled selvage. Single width fabric. Fabric shall be black vinyl coated.

2.04 CONCRETE MIX

A. Concrete: Normal Portland cement; 3,000 psi at 28 days; 4 inch slump, conforming to ACI 318 Section 5.2, CBC Section 1903A and Division 32 and as indicated on Drawings.
   1. Design Mix: Conform to Section 1903A CBC.
   2. Reinforcement: per Division 32 and as indicated on drawings.

2.05 COMPONENTS

A. Nominal pipe size (NPS) and weight in pounds per lineal foot, ASTM F1083; Schedule 40 Intermediate Strength Grade 50,000 psi, hot-dipped galvanized steel pipe, minimum 1.8 oz / sq. ft.

	NPS	Pounds/LF	Outside Diameter Min. (OD)
1.	1-1/4:	2.27	1.66"
2.	1-1/2:	2.72	1.90"
3.	2:	3.65 (3.87 for sq. pipe at exit gate frames)	2.375"
4.	2-1/2:	5.79 (5.79 for sq. pipe at exit gate posts)	2.875"
5.	3:	7.58	3.50"
6.	3-1/2:	9.11	4.0"
7.	4:	10.79	4.50"

8.	4-1/2:	12.55	5.0"
9.	5"	14.92	5.563"
10.	6:	18.97	6.625"
11.	8:	28.55	8.625

B. Line Posts for fencing

	Fence height in feet	NPS (min. inches)
1.	Less than 6 feet	1-1/2
2.	6 to 7.9	2
3.	8 to 11.9	2-1/2
4.	12 to 16	3-1/2
5.	16 to 20	6

C. Terminal Posts - end, pull, corner and slope.

	Fence height in feet	NPS (min. inches)
1.	Less than 6 feet	2
2.	6 to 8	2-1/2
3.	8 to 12	3-1/2
4.	12 to 16	6
5.	16 to 20	8

D. Swing gate posts, single leaf; opening widths in feet:
1. Up to 6 wide: 2 inch NPS
2. 6-13 wide: 3-1/2-inch NPS
3. 13-18 wide: 6-inch NPS

E. Swing gate posts, double leaf, opening widths in feet:
1. Up to 12 wide: 2-inch NPS
2. 12-26 wide: 3-1/2 NPS
3. 26-36 wide: 6-inch NPS

F. Top rail, mid rails, and braces: 1-1/4" NPS, plain end, sleeve coupled.

G. Brace Rails: Horizontal, match size of largest adjacent post.

H. Top Rail Expansion Sleeve: 7 inches expansion sleeve with spring.

I. Swing Gate Frames: 1-1/2 inches diameter

J. Stiffeners for swing gates:1-1/4 inches diameter

K. Caps: Domed cast steel or malleable iron, galvanized and coated; sized to post dimension, set screw retained.

L. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings: Galvanized Steel.

M. Tension Wire: 7 gage thick coil spring steel, single strand, galvanized.

N. Truss Rod and Tightener: 3/8-inch diameter; furnish one at each end, pull, and gate post, and at both sides of corner posts.

O. Double Gates: Master-Halco Series 17200, latch assembly with drop rod (cane bolt).

2.06 SWING GATES (UTILITY)

A. Gate Frames: 1-1/4" NPS steel pipe, welded corners, hot-dip galvanized after fabrications.

B. Horizontal Stiffeners for Swing Gates: 1-1/4" NPS at mid-point.

C. Hardware: Heavy-duty, galvanized ferrous metal industrial quality as manufactured by Master-Halco/Anchor Fence, Inc., Baltimore, MD or equal.

D. Double Gates: full height 1-3/8" center drop rod with fork latch and four (4) rod guides, to hold inactive leaf. Provide locking device and padlock eyes as an integral part of latch, for locking both gate leaves.

E. Provide 12" x 12" concrete center drop rod retainers at center of double gate openings, for inactive gate in both open and closed positions. Provide galvanized sleeve grouted into concrete retainer or in concrete paving.

F. Provide gate keeper for retaining active double gate in open position, and for single gate in open position.

G. Locking: Provide padlock capability.

H. Hinges: Structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180 degrees as indicated on drawings.
   1. Provide two (2) per leaf on 4' high gates, three (3) per leaf on 6'-8' high gates, and four (4) per leaf on 8'-10' high gates.

I. Latch: For type latch capable of retaining gate in closed position, Master-Halco Series 16000 or equal.

J. Gate Hardware Mounting: Mount at 34 to 44 inches above finished surface.

2.07 SWING GATES (PEDESTRIAN)

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

B. All gates intended for pedestrian use, including ticket gates shall comply with all applicable requirements of doors, CBC Section 1010.2. 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.

C. Exit Gate Frames: 2-inch square steel pipe, welded corners, hot dip galvanized after fabrication.

D. Horizontal Stiffeners for swing gates: 1-1/4" NPS.

E. Sizes: As indicated on the Drawings, minimum widths of gates shall not be less than 36" (clearance of opening width shall not be less than 32 inches).

F. Hardware: Heavy-duty, galvanized ferrous metal industrial quality as manufactured by Master-Halco/Anchor Fence Inc., Baltimore, MD. Von Duprin, Adams Rite, Sargent, Trimco or equal as approved in accordance with Division 01, General Requirements for substitutions.

1. Hinges: Structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180 degrees as indicated on drawings.
   a. Provide two (2) per leaf on 4' high gates, three (3) per leaf on 6'-8' high gates, and four (4) per leaf on 8'-10' high gates.
2. Latch: Fork type latch capable of retaining gate in closed position, except gates with exit devices (panic hardware); Master-Halco, Series 16000 or approved equal.
   a. At accessible gates, hardware shall not require pinching, grasping or twisting motion. Weld 1-1/2 inches by 2-1/2 inches by 1/4-inch diameter U-shaped galvanized rod to fork latch, both sides, for ADA accessibility as indicated on Drawings. Dress welded joints, leaving no burrs, or sharp abrasive corners, edges or surfaces, in accordance with NOMMA Guidelines for Finish 1. Touch up with Solder Zinc Alloy for Repair: Welco Gal-Viz self-fluxing solder alloy, Galvalloy, Galvabar or equal, ASTM A780, paragraph A1. Repair Using Zinc-Based Alloys.
3. 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 ½" of the (face of) gate to prevent catching on the clothing or persons.
4. Exit Device at Exit Gates only, outswing in accordance with 2019 CBC Chapter 10, Section 1010, 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 5 pounds 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 shall be curved with a return to within ½" of the face of gate to prevent catching on the clothing or persons.
   b. 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 latch bolt keeper.
   c. Fabricate Steel Lock Box, galvanized, 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.

5. Locking: Provide padlock capability on non-pedestrian gates only. Do not install padlock capability on Exit Gates, gates on Path of Travel with Exit Devices and other pedestrian gates.
6. Gate Hardware Mounting: Mount at 34 to 44 inches above walking surface and according to 2019 CBC Sections 1010.1.9.1, 1010.1.9.2 and 11B-404.2.7, 11B-404.2.9.
   a. Provide strike strap and stop plate.
   b. Provide bolt keeper and pick protector.
   c. Provide 14-gauge lock box.
7. Install 0.125-inch-thick aluminum protective plate 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 kickplate 10 inches high on push side, CBC 11B-404.2.10, 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 plates shall be capped with a horizontal stiffener. Secure with #8 stainless steel screws, 4 places along top and bottom and 2 places along each side of kickplate. Clear space below gate shall be 3 inches maximum from walking surface.
9. Gate Closer for push out installation: ANSI A156.4, Grade 1. Install hydraulic gate closer, Model Dor-O-Matic SC71, Norton 7501, LCN 4041, or equal. Arm Rw/PA (regular arm with parallel arm bracket), adapter offset shoe, plate and spacer, TBSRT (thru bolt self reaming and tapping) screws, plate. ADA compliant. With metal cover, aluminum finish. Attached to 2-1/2 inches square lintel. Opening force to be limited to 5 lbs maximum.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with Section 304-3, SSPWC, ASTM F567 and manufacturer's instructions.

B. Footings:
1. Terminal and Line post footing diameter: 4 times the diameter of the largest core section of the post, or 12 inches minimum. Embed posts into footing 6 inches less than the depth of the footing. Slope at top to shed water, 1/4" per foot unless noted otherwise.
2. Terminal and Line post footing depth: 36 inches deep minimum for four feet and add 3 inches for each foot over four feet, unless noted otherwise.
3. Gate post footing diameter: 4 times the diameter of the largest core section of the post, or 16" diameter minimum, 18" diameter minimum for 18' - 26' gate leaf width, 24" diameter minimum for 27' - 32' gate leaf, unless noted otherwise.
4. Gate post footing depth: minimum 36" deep, 48" deep for 18' - 24' gate leaf width, 54" deep for 27' - 32' gate leaf width, unless noted otherwise.
5. For fencing higher than 12 feet: footing depth of 60" minimum and diameter of 36" minimum unless noted otherwise on drawings, unless noted otherwise.
6. Reinforcing: per Division 32 and as indicated on drawings.
7. Posts set in hard rock concrete: drill holes 1 inch larger than post and set in non-shrink grout.

C. Provide fence height as indicated on Drawings.

D. Space line posts at intervals not exceeding 10 feet.

E. Set terminal posts and line posts plumb, in concrete footings with top of footing 2 inches above finish grade or as detailed. Slope top of concrete for water runoff.

F. Provide top rail through line post tops and splice with rail sleeves, outside sleeve type.

G. Brace each terminal post (gate, corner, and end posts), corner, and end posts to adjacent line posts with horizontal center brace rail and diagonal truss rods. Install brace rail to adjacent line posts at corner posts, one bay from end and gate posts.

H. Center Rails: Install mid rails between posts with fittings and accessories for fabric height 12' and over, inclusive.

I. Install center and bottom brace rail on gate leaves, welded construction.

J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

K. Position bottom of fabric 2 inches above finished grade or paving.

L. Fasten fabric to top rail, line posts, braces and bottom tension wire with tie wires maximum 16 inches on centers, one complete wrap.

M. Attach fabric to end, corner and gate posts with tension bars and tension bar clips.

N. Install bottom tension wire stretched taut [Install bottom rails] between terminal posts, (corner posts shall have brace rail).

O. Double Gates: Provide drop rod to hold inactive leaf. Provide locking device and padlock eyes as an integral part of latch, requiring for locking both gate leaves.

P. Provide concrete center drop and drop rod retainers at center of double gate openings, except gates with panic hardware.

3.02 TESTING

A. At Architect's option, Contractor shall be required to cut any pipe column after installation to confirm requirements of this Specification. If conformance is confirmed, replacement members shall be installed at Owner's cost. Components not meeting required standards shall be replaced.

END OF SECTION

SECTION 32 80 00

IRRIGATION

PART 1 - GENERAL

Construction Documents and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section.

1.01 DESCRIPTION

A. Scope of Work: 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 non-potable water.

B. Utilize and accept as standards manufacturer's recommendations and/or installation details for any information not specifically detailed on the Drawings.

1.02 RELATED SECTIONS

A. SUBMITTAL PROCEDURES: Section 01 33 00.

B. CLOSEOUT PROCEDURES: Section 01 77 00.

C. ELECTRICAL: Division 26.

D. EARTHWORK: Section 31 00 00.

E. LANDSCAPING: Section 32 90 00.

1.03 GUARANTEE

A. Guarantee all workmanship and materials hereunder against defective workmanship and materials, including damage by leaks and settlement of irrigation trenches, for the duration specified in Division 01 of these Specifications. (The Contractor is not responsible for vandalism or theft after date of final acceptance.)

1.04 QUALITY CONTROL

A. Qualifications of Contractor: 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. 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 “Inspection Requirements” prior to progressing to the next level of work.

D. 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.

E. Standards:

1. Provide work and material in full accordance with the rules and regulations of the California Electric Code; the California 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.

F. Delivery, Storage, and Handling:

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

2. 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 and off the ground with blocks.

G. Comply with the requirements of Section 01 77 00 – CLOSEOUT PROCEDURES.

1.05 INSPECTION REQUIREMENTS

A. Request and hold a pre-construction 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.

B. 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 00 00 - EARTHWORK.

C. 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 Part 3.15 of this Section),

2. Trench depth,

3. Sleeves under pavement,

4. Flushing of all mainlines and lateral lines,

5. Installation of mainline thrust blocks,

6. Installation of Leemco joint restraints and bolts,

7. Backfill and pipe bedding,

8. Layout of heads,

9. Installation of subsurface inline drip tubing (with Landscape Architect),

10. 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.

D. 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.

1.06 SUBMITTALS AND SUBSTITUTIONS

A. Comply with requirements of Section 01 33 00 – SUBMITTAL PROCEDURES.

B. 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.

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

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

E. 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.

F. 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.

1.07 PROJECT CONDITIONS, AND PROTECTION

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

C. 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.

1.08 MAINTENANCE AND OPERATING INSTRUCTIONS

A. Furnish three complete sets of 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.

B. Incorporate the following information in these sets:

1. Complete operating instructions for each item of irrigation equipment.

2. Typewritten maintenance instructions for each item of irrigation equipment.

3. Manufacturer's bulletins which explain installation, service, replacement parts, and maintenance.

4. Service telephone numbers and/or addresses posted in an appropriate place as designated by Owner's Representative.

1.09 RECORD DRAWINGS

Upon completion of work, and as a precedent to final payment, deliver to Owner's Representative one complete set of reproducible originals of Drawings showing work exactly as installed. (See "Record Drawings" in Part 3.18 of this Section)

PART 2 - PRODUCTS

2.01 GENERAL

Use materials as specified; any deviation from the Specifications must first be approved by the Owner's Representative in writing. All material containers or certificates shall be clearly marked by manufacturer as to contents for inspection.

2.02 MATERIALS

A. Central Control System: As indicated on Drawings.

B. Master Valves and Flow Sensors: As indicated on Drawings.

C. Automatic Control Valves: As indicated on Drawings.

D. Gate Valve: As indicated on Drawings.

E. Pipe and Fittings:

1. PVC pipe: As indicated on Drawings.

2. PVC fittings for mainline two inches (2") and smaller and all lateral lines: High impact, standard weight, Schedule 40, molded PVC as manufactured by George Fischer, Lasco, Spears, or approved equal.

3. Ductile iron fittings for all mainline fittings two and one-half inches (2 ½") and larger: Leemco joint restraint fittings or approved equal.

4. All plastic pipe and fittings: Continuously and permanently marked with manufacturer's name, type of material, IPS size, schedule, NSF approval, and code number.

5. 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.

6. Use 45-degree fittings for changes in depth of pipe, and at transition from main line to automatic control valves.

7. Piping above ground: Schedule 40 galvanized steel with cast-iron fittings.

8. Piping used for electrical purposes to be Schedule 40 PVC Rigid Nonmetallic Conduit electrical conduit.

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

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

H. Sprinkler Heads: As indicated on Drawings.

I. Quick Coupler Valves: As indicated on Drawings.

J. Sleeves: As indicated on Drawings.

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

L. Sub-surface Inline Drip Tubing:

1. Tubing: As indicated on Drawings. Make all tubing connections with manufacturer-approved fittings. See Drawings for emitter flow rates and spacing.

2. Soil Staple: Hold tubing in place with soil staples spaced evenly every three to five feet (3’ - 5’) on center, and with two staples at each change of direction.

3. Line Flushing Valve: As indicated on Drawings.

4. Pressure Regulator: As indicated on Drawings.

5. Disc Filter/Screen Filter: As indicated on Drawings.

M. 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.

N. Single Station Decoder: As indicated on Drawings.

O. 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.

P. 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.

Q. Valve Identification Tags: Christy's irrigation ID tags, standard yellow color or approved equal.

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

PART 3 - EXECUTION

3.01 SITE CONDITIONS

Locations of existing utilities and other improvements shown on the Drawings are approximate. Verify existing conditions and, should any utilities be encountered that are not indicated on the plans, notify the Owner's Representative immediately. Accept responsibility for any damages caused to existing services.

3.02 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. Examination: Examine conditions of work in place before beginning work; report defects.

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

D. 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.

E. Surface Preparation: Prior to beginning sprinkler irrigation work, complete placement of topsoil as specified in Section 31 00 00 – EARTHWORK. Notify Project Inspector of irregularities if any.

3.03 AUTOMATIC CONTROLLER/CENTRAL CONTROL SYSTEM

A. Connect automatic control valves to controller(s) in sequence as shown on Drawings.

B. Install all exposed wires to a minimum of twenty-four inches (24") beyond controller within a UL approved rigid conduit.

3.04 GRADING

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.

3.05 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.

3.06 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. 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 pipe bedding and three inches (3") of backfill above the pipe. The remainder of the trench backfill material can be native soil. Do not allow wedging or blocking of pipe.

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 bubblers, and eighteen inches (18") cover for rotor heads.

3. Sub-surface inline drip tubing: five inches (5") cover.

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.

3.07 BACKFILL AND COMPACTING

A. General: Do not begin until hydrostatic tests are completed. When system is operating and after required tests and inspections have been made, backfill trenches under paving areas to the compaction rate specified in Section 31 00 00 – EARTHWORK.

B. Place backfill in six-inch (6") layers and compact with an acceptable mechanical compactor.

1. Compact backfill material in landscape areas to eighty-five percent (85%) maximum dry density of the soil.

2. 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.

C. 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 00 00 – EARTHWORK, it may be used for finish grading.

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

3.08 CONTROL WIRES

A. General: Install control wires beneath sprinkler main line whenever possible; tape wires to mainline pipe. Provide one spare wire for each controller.

B. Slack Wire: Provide eighteen inches (18”) of slack wire for each wire connected to automatic control valve. Slack wire shall be coiled and left in the valve box. Tape wires in bundles every ten feet (10’); do not tape wires in sleeves.

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

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

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

G. Wire Termination: Install wire in a valve box with eighteen inches (18”) of slack wire coiled and individually capped with approved waterproof sealing pack.

H. Spare Wire: Install two (2) spare wires along each wire path. If there is more than one wire path from the controller, the contractor to install two (2) spare wires per path. Provide eighteen inches (18”) of slack wire at each automatic control valve.

3.09 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.

3.10 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.

3.11 FLUSHING LINES

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

3.12 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.

3.13 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. Elastomeric Seal (Gasket) 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: General: Clean spigot-end of pipe as in "Cleaning" above prior to applying lubricant recommended by pipe manufacturer. 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. Joint Restraints: Install per manufacturer’s recommendations.

7. 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.

D. Sub-surface Inline Drip Tubing:

1. Install as per Drawings and as per manufacturer’s recommendations. Prior to installation of tubing, obtain approval of finish grade in all planters where tubing is to be installed. (See inspection requirements.)

2. After tubing is installed, operate system for coverage test. Obtain approval of the Project Inspector and/or Landscape Architect prior to backfill.

3.14 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.

3.15 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.

3.16 CLEAN-UP

Remove debris resulting from work of this Section.

3.17 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.

3.18 RECORD DRAWINGS

A. 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.

B. Record the as-built information on reproducible plans provided by the Architect. Complete and submit the Record Drawings to the Architect before applying for payment for work installed.

C. As-built drawings are to be completed electronically with a pdf editing software or computer aided drafting software. As-built drawing done by hand will not be accepted for final submittal.

D. Show the following on the Record Drawings accurately to scale and dimensioned from two permanent points of reference:

1. Distance of mainline from nearby hardscape.

2. Location of automatic control valves, quick couplers, and gate valves.

3. Location and size of all sleeves.

4. Location of automatic control wires and spares.

3.19 OPERATION MANUALS

Deliver two complete sets of manufacturer's warranties, Contractor guarantees, instruction sheets, parts lists and operation manuals to the Architect before requesting final acceptance of the project. Do not request final inspection until the sets are approved.

END OF SECTION

LANDSCAPING

Section 32 90 00

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope of Work: Furnish all labor, materials, tools, equipment, and transportation required to perform and complete the following work as specified herein:

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

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.

C. Construction Documents and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications sections, apply to this section.

1.2 RELATED SECTIONS

A. SUBMITTAL PROCEDURES: Section 01 33 00.

B. CLOSEOUT PROCEDURES: Section 01 77 00.

C. EARTHWORK: Section 31 00 00.

D. IRRIGATION: Section 32 80 00.

1.3 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. See Division 01 for other applicable guarantee requirements.

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 as per "Landscape Maintenance" in Part 3.12 of this Section, using plants of the same kind and size specified in plant list.

1.4 QUALITY CONTROL

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. 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 "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. Delivery, Storage, and Handling:

1. 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.

2. Bulk Materials:

a. Do not dump or store bulk materials near structures, utilities, walkways or pavements, or on existing turf areas or plants.

b. 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.

c. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

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

10. 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.

11. Do not remove container-grown stock from containers before time of planting.

12. 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).

13. 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.

14. 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.

G. Decomposed Granite with Binder Mock-up:

1. Install 4 ft wide x 10 ft long mock-up of decomposed granite with Stabilizer additive at location as directed by owner's representative for review and acceptance prior to placement of decomposed granite.

H. Comply with the requirements of Section 01 77 00 – CLOSEOUT PROCEDURES.

1.5 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. Request and hold a pre-construction 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. 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 00 00 – EARTHWORK.

2. The placement of landscape backfill material is as specified in this Section.

3. Prior to the commencement of the work specified in this Section, the coverage and operation of the sprinkler irrigation system are as specified in Section 32 80 00 - IRRIGATION.

4. The soil amendment does not include any metal fragments. (Obtain a letter from the manufacturer stating that the material submitted for use on this project has no metal or foreign objects. Submit this letter as part of the Data Sheet submittal package [see "Submittals and Substitutions" in this Section])

5. 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.

6. Soil amendments, fertilizer, bark mulch and materials used for hydroseeding 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.

7. Prior to planting, amendments and conditioners have been incorporated as per pre-planting recommendations, and planting areas have been made ready to receive planting.

D. 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.

E. Beginning of Maintenance Period: Verify all work is complete, then request and hold a meeting to include the Landscape Architect, Project Inspector, Architect and Owner's Representative for authorization to begin the landscape maintenance period.

F. End of Maintenance: Verify that all work is complete and acceptable, and that the maintenance has been completed per specifications; and continue to provide landscape maintenance until the Owner's Representative has accepted the work.

1.6 SUBMITTALS AND SUBSTITUTIONS

A. See Section 01 33 00 – SUBMITTAL PROCEDURES for additional requirements.

B. 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.

C. Data Sheets: Provide product data for each type of landscape material indicated in the Drawings and Specifications.

D. 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. (if needed)

4. Decomposed Granite: (3) one-quart zip-locked plastic bags.

E. Provide soils analysis reports prepared by a qualified soils laboratory in compliance with the Soil Testing Requirements under “Soil Testing” in Part 3.02 of this Section.

F. 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.

1.7 PROTECTION AND CLEAN-UP

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.

E. 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.

1.8 PLANTING SCHEDULE / ENVIRONMENTAL REQUIREMENTS

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.

C. 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.

1.9 LANDSCAPE MAINTENANCE PERIOD REQUIREMENTS

A. Beginning of Landscape Maintenance Period:

1. General: Landscape Maintenance Period does not begin until all work is installed, 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:

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 Part 3.12 of this Section.

C. Final Acceptance of the Landscape Maintenance Period:

Request the final inspection forty-eight (48) hours in advance. If items require attention, hold on-site meetings until Landscape Architect can certify, in writing, and in concurrence with the Owner's Representative, the successful completion of the Landscape Maintenance Period.

1.10 RECORD DRAWINGS

Upon completion of work, and as a precedent to final payment, deliver to Owner's Representative one complete set of reproducible originals of Drawings showing work exactly as installed.

PART 2 - PRODUCTS

2.1 GENERAL

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.

D. Decomposed Granite:

1. Reddish-brown in color.

2. A mixture of fines to three-eighths inch (3/8") size particles with no clods.

3. Free of vegetation, other soils, debris and rocks, and of such nature that it can be compacted readily under watering and rolling.

E. Decomposed Granite Binder: Shall be Stabilizer by Stabilizer Solutions.

F. Weed Fabric: As indicated on Drawings.

G. Root Barrier: As indicated on Drawings.

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: Ninety percent (90%) Perennial Ryegrass and ten percent (10%) 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, lawn hydroseeded areas 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. "Cultipack" all areas to receive sod or hydroseed.

   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 a review and obtain approval of Landscape Architect prior to commencement of planting or hydroseeding.

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 flush to finish grade in preparation to receive hydroseeding or 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 ROOT BARRIER INSTALLATION

A. Root barriers location are specifically shown on the plan. If a tree is moved during construction to a location where root barrier is not shown on the plan, the following minimum requirements are to be met:

1. Install root barrier where trees are planted within sixty inches (60”) of paving or other hardscape elements, such as walls, curbs, and walkways.

2. Install root barrier continuously for a distance of five feet (5’) in each direction from the tree trunk, for a total distance of ten feet (10’) per tree. If trees are spaced closer, use a single continuous piece of root barrier.

B. Align root barrier vertically and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.

C. Position top of root barrier just below the top of adjacent hardscape element but above finish grade of the soil so that is visible.

D. If there are concrete spoils or overpour that is impeding the root barrier from being installed directly adjacent to the hardscape element, the contractor is to remove the extra concrete in a manner that does not damage the integrity of the hardscape element.

E. Do not distort or bend root barrier during construction activities.

F. Do not install root barrier surrounding the root ball of tree.

3.5 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.

3.6 WEED CONTROL

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.

3.7 BARK MULCH

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.

3.8 DECOMPOSED GRANITE WITH BINDER

A. General: Prepare all areas to receive decomposed granite, and treat sub-grade with weed control.

B. Placement:

   1. Do not install during rainy conditions or below 40 degree Fahrenheit and falling.

   2. After pre-blending, place the Stabilized decomposed granite on prepared sub-grade. Level to desired grade and cross section.

   3. Water heavily for full-depth moisture penetration of the Stabilized pathway profile, 25 to 45 gallons of water per 1-ton must be applied. During water application randomly test for depth using a probing device, which reaches full depth.

C. Compaction:

1. Upon thorough moisture penetration, compact aggregate screening to 85% relative compaction by equipment such as; a 2 to 4-ton double drum roller or a 1,000-lb. single drum roller. The roller size will depend on the depth of the pathway. DO NOT use a vibratory plate compactor or vibration function on roller as vibration separates large aggregate particles. Do not begin compaction for 6 hours after placement and up to 48 hours.

2. If surface aggregate dries significantly quicker than subsurface material, lightly mist surface before compaction.

3. Take care in compacting decomposed granite when adjacent to planting and irrigation systems. Hand tamping with an 8” or 10” hand tamp recommended.

D. Inspection:

1. Finished surface of pathway shall be smooth, uniform and solid. There shall be no evidence of chipping or cracking. Cured and compacted pathway shall be firm throughout profile with no spongy areas. Loose material will not be present on the surface after installation, but may appear after use and according to environmental conditions. Pathway should remain stable underneath the loose granite on top. Any significant irregularities in path surface shall be repaired to the uniformity of entire installation.

E. Repairs:

1. Excavate damaged area to the depth of the stabilized decomposed granite and square off sidewalls.

2. If area is dry, moisten damaged portion lightly.

3. Pre-blend the dry required amount of Stabilizer powder with the proper amount of decomposed granite in a concrete mixer.

4. Add water the pre-blended decomposed granite and stabilizer. Thoroughly moisten mix with 25 to 45 gallons per 1-ton of pre-blended material or to approximately 10% moisture content.

5. Apply moistened pre-blended decomposed granite to excavated area to finish grade.

6. Compact with an 8”-10” hand tamp or 250 to 300-pound roller. Keep traffic off area for 12 to 48 hours after repair has been completed.

F. Upon end of landscape maintenance period, all weed/grass shall have been removed and surface re-compacted.

3.9 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.

3.10 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 and 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.

5. Decomposed Granite with Binder:

a. Remove debris, such as paper, grass clippings, leaves or other organic material by mechanically blowing or hand raking the surface as needed.

b. During the first year, a minor amount of loose aggregate will appear on the paving surface (1/16" to 1/4"). If this material exceeds a ¼", redistribute the material over the entire surface. Water thoroughly to the depth of 1". Compact with power roller of no less than 1,000 lbs. This process should be repeated as needed.

c. If cracking occurs, sweep fines into the crack, water thoroughly and hand tamp with an 8"-10" hand tamp plate.

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

7. Request, forty-eight hours (48 hrs.) in advance, on-site visits by the Landscape Architect to determine the end of the Landscape Maintenance Period.

END OF SECTION

SECTION 33 40 00

SITE DRAINAGE

PART 1 - GENERAL

1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS

A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 50 00, Construction Facilities and Temporary Controls.

B. Section 31 23 33, Trenching and Backfilling.

C. Section 32 12 00, Asphalt Concrete Paving.

D. Section 32 16 00, Site Concrete

1.03 QUALITY ASSURANCE

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

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

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

1.04 SUBMITTALS

A. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

1.05 WARRANTY

A. Refer to General Conditions.

1.06 REFERENCES AND STANDARDS

A. ANSI/ASTM 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.

B. ANSI/ASTM D1556-00 - Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ANSI/ASTM 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.

D. ANSI/ASTM D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).

E. ANSI/ASTM 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).

H. 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.

I. California Plumbing Code current edition.

1.07 DELIVERY, STORAGE AND HANDLING

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

B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.08 PROJECT CONDITIONS

A. 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.

1.09 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.

1.10 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.

1.11 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.

1.12 TESTING

A. 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.

1.13 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

2.01 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. Sun damaged pipe will be rejected.
   2. High density polyethylene pipe (HDPE): The pipe shall be corrugated exterior/smooth interior pipe and water tight per ASTM D3212 with dual wall water tight gasket fittings.

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

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

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

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

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

G. Filter Fabric: Mirafi 140N.

PART 3 - EXECUTION

3.01 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.

3.02 INSTALLATION

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.

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 23 33 – 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.

3.03 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'.

3.03 DEWATERING

A. Contractor to provide trench dewatering as necessary, no matter what the source is, at no additional cost to the owner.

B. If the previously excavated material from trenching is too wet to achieve trench backfill compaction the contractor shall make a reasonable effort to aerate and dry the material per section 31 00 00, 3.08, B.

3.04 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.

3.05 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 all storm drain inlets, structures, and connecting pipes.

END OF SECTION