SPECIFICATIONS
Project No. 24038

Playground Addition at Gateway at Glen View Elementary School

Santa Clara County Office of Education
Santa Clara County, California

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DSA File No. 43-62
DSA Application No. 01 - 121862

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Santa Clara County Office of Education
Santa Clara County, California

Division of the State Architect
Department of General Services

Mark Finney, Architect
Finney Architects

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DIVISION 31 – EARTHWORK

DIVISION 32 - EXTERIOR IMPROVEMENTS

DIVISION 33
(No work in the above division)

END OF SECTION

SECTION 02 41 13 - SELECTIVE SITE DEMOLITION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Demolition, removal, salvage and disposal of existing site features, fences, structures and materials where indicated on the drawings and as specified in this section.
B. Demolition and removal of concrete foundations, sidewalks, concrete and asphaltic paving as shown on the drawings
C. Demolition and removal of existing utilities as shown on the drawings

1.02 RELATED SECTIONS

A. Section 31 10 00 Site Clearing

1.03 SUBMITTALS

A. Permits and Certificates.
    1. Permit for transport and disposal of debris.
    2. SWIPP Permits

1.04 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of capped utilities and subsurface obstructions.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable State and local codes for demolition of structures, safety of adjacent structures, dust control, and disposal.
B. Obtain required permits from authorities.
C. Notify affected utility companies before starting work and comply with their requirements.
D. Do not close or obstruct roadways, sidewalks, or hydrants without written permission from Owner.
E. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials and notify owner immediately.
F. Notify Owner a minimum of 48 hrs. in advance of interrupting or shutting down any utilities..

1.06 SCHEDULING

A. Provide detailed descriptions for demolition and removal procedures.

PART 2 – PRODUCTS

2.01 FILL MATERIALS

A. Fill Material: Use on site fill material under provisions of Section 31 23 00 excavation and fill.

PART 3 – EXECUTION

3.01 INSPECTION

A. Verify areas to be demolished are unoccupied and discontinued in use.
B. Do not commence work until conditions are acceptable to Construction Manager.

3.02 PREPARATION

A. Provide, erect, and maintain temporary barriers, enclosures, security fences and shoring at demolition locations in accordance with Division One and other related specifications to protect personnel.
B. Protect existing structures and utilities which are not to be demolished.
C. Provide temporary wiring and connections to maintain existing telephone, electrical, instrumentation and control systems in service during construction.
D. Protect designated trees and plants from damage.
E. Mark location of existing utilities.

3.03 GENERAL REQUIREMENTS

A. Sprinkle Work with water to minimize dust where applicable. Provide hoses and water connections for this purpose.
B. Do not use water to extent causing flooding, contaminated runoff, or icing.
C. Break concrete into sections less than 2 feet in any dimension, and remove from site
D. Repair damage to adjacent structures.
E. Remove existing exposed piping and electrical wiring and conduit to be abandoned to structural surface, cut flush, and finish to match existing surfaces.
F. Remove buried piping, wiring, and conduit to be abandoned as required for the Work. Plug the remainder flush.

3.04 DISPOSAL

A. Do not store or burn waste materials on-site.
B. Transport demolition debris to designated off-site disposal area.

3.05 SITE DEMOLITION

A. Disconnect, remove, cap and identify designated utilities within demolition area.
B. Remove asphalt paving, parkway, curb, gutter, sidewalk and other concrete as shown on plans.
C. Remove and dispose of existing site fencing, , fabric, screws, bolts, posts, clips, concrete footings at fence post removal as shown on the plans.
D. Remove storm sewer items where shown on the drawings.
E. Rough grade and compact areas affected by demolition to maintain site grades and contours as shown on drawings.
F. Remove demolished materials from site.
G. Do not burn or bury materials on site, unless otherwise directed by Owner. Leave site in clean condition.

END OF SECTION 02 41 13

SECTION 03 20 00 – CONCRETE REINFORCEMENT

PART I – GENERAL

1.1 Description of Work

A. Work under this Section includes the furnishing and installing of all steel reinforcing for cast-in-place concrete, complete, with all related items, accessories and incidentals required, such as ties, spacing devices inserts and all other material required to complete installation.

1.2 Applicable Standards (latest editions apply)

A. ACI- American Concrete Institute:

1. 301, Specifications for Structural Concrete for Buildings.

2. 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.

3. 318, Building Code Requirements for Reinforced Concrete.

B. ASTM- American Society for Testing and Materials, Referenced Standards

C. AWS- American Welding Society:

1. AD1.4 Structural Welding Code- Reinforcing Steel

2. A5.1 Mild Steel Covered Arc-Welding Electrodes

D. CRSI- Concrete Reinforcing Steel Institute:

1. Manual of Standard Practice

2. Recommended Practice for Placing Reinforcing Bars

E. ICC- International Code Council:

1. CBC – 2022 California Building Code (California Code of Regulations, Title 24, Part 2)

1.3 Submittals

A. Shop Drawings of all reinforcing steel shall be submitted for approval.

B. Mill Reports for each different heat to be used on the job shall be submitted for approval. Comply with CBC, Section 1910A.2.

1.4 Quality Assurance

A. Welders shall be qualified in accordance with AWS D1.4.

PART II – PRODUCTS

2.1 Materials

A. Reinforcing bars: Deformed, new billet-steel bars conforming to ASTM Designation A615, Grade 60 or ASTM A706 unless noted otherwise.

B. Reinforcing mesh: Welded wire fabric conforming to ASTM A185.

C. Tie wires and spirals: ASTM A82.

D. Reinforcement supports

1. At reinforcing placed over sand or earth, use precast concrete cubes.

2. At reinforcing placed over forms, provide supports with legs which are hot dip galvanized, stainless steel or plastic protected.

E. Mechanical Bar Splice: Xtender by Headed Reinforcement Corp. or equal to develop a minimum of 125% of yield strength of bar.

2.2 Fabrication: Except where specified otherwise herein or shown otherwise on the plans, reinforcing steel shall be cleaned, fabricated, placed, tied and supported in accordance with ACI 301 and ACI 315.

PART III – EXECUTION

3.1 Installation

A. Reinforcing bars shall be accurately placed and shall be supported and secured against displacement by the use of adequate and proper supporting and spacing devices, tie wire, etc., so that it will remain in its correct location in the finished work. No supporting devices shall be used that will impede the flow of concrete.

B. Do not bend or straighten reinforcing in any manner that will injure the material.

C. Install splices for reinforcing bars in accordance with drawings and ACI 318. Stagger splices in adjacent bars 5’ – 0".

D. Reinforcing mesh shall be laid flat in place. Lap mesh at sides and ends 12 inches. Wire mesh together at 24 inches on center.

3.2 Clearances

A. Where not shown otherwise on the drawings, the minimum concrete coverage for steel reinforcement shall be as follows:

1. Where concrete is deposited against ground 3”

2. Concrete in forms exposed to earth or weather 2”

B. The clear spacing between parallel bars shall be not less than 1-1/2 times the normal diameter of the maximum size aggregate, and in no case less than 1-1/2 inches, except at splices which may be wired together.

3.3 Welding: Perform all welding in accordance with AWS D1.4.

3.4 Field Quality Control

A. Contractor shall examine placement of all reinforcement and embedded items prior to inspection by Owner's Testing Agency to ensure the proper clearances have been maintained and that all reinforcement and inserts are firmly tied to resist displacement.

B. The Owner's Testing Agency will inspect

1. In-place reinforcing steel

2. Field welding of reinforcing steel

3.5 Notification: Notify the Architect two working days in advance of concrete placement.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART I – GENERAL

1.1 Description of Work

A. Work under this Section includes the furnishings and installing of all concrete work, complete, with all related accessories, items and incidentals required.

B. Coordinate installation of all inserts and embedded items required or indicated.

1.2 Applicable Standards (latest editions apply)

A. ACI- American Concrete Institute:

1. 301, Specifications for Structural Concrete for Buildings.

2. 305, Recommended Practice for Cold Weather Concreting.

3. 306, Recommended Practice for Hot Weather Concreting.

4. 318, Building Code Requirements for Reinforced Concrete.

B. ASTM- American Society of Testing and Materials, Referenced Standards.

C. ICC- International Code Council:

1. CBC - 2022 California Building Code (California Code of Regulations, Title 24, Part 2)

1.3 Submittals

A. Mix Design and Tests:

1. Submit mix designs and compressive strength test reports from previous applications for specified types of concrete.

2. One copy of all test reports shall be forwarded to DSA, the Architect, the Structural Engineer, the Inspector of Record within fourteen days of the test. Test reports shall comply with all requirements of CCR Title 24, Part 1, Section 4-335.

3. The concrete mixes shall be based on designs of a professional testing laboratory, verified by test, also in accordance with ACI 318 Chapter 26.

PART II – PRODUCTS

2.1 Materials

A. General: Materials for cast-in-place concrete shall be set as forth in ACI 301 except as modified herein and as otherwise indicated in project documents.

B. Portland Cement: ASTM C150 Type II modified, with maximum alkali content of 0.6 percent (from only one source). Comply with Title 24, Section 1903A.

C. Aggregates: ASTM C33, (from source as approved by the Testing Agency). Comply with Title 24, Section 1903A.5.

D. Water: clean, potable, free of injurious materials.

E. Admixtures: Only brand products documented to have had not less than five years of satisfactory performance shall be used. Admixtures containing chlorides shall not be used. Comply with Title 24, Section 1904A and ACI-318.

1. Air Entraining: ASTM C260

F. Grout: Manufactured pre-mixed. Non-ferrous, non-staining, flowable grout which will not shrink as it cures, 5000 psi @ 7 days.

G. Fly Ash: Shall conform to CBC Section 1903A.

2.2 Concrete Mix

A. Ready-Mix Concrete: ASTM C94.

2.3 Proportion and Mixture

A. Proportioning mixtures and production of concrete shall be in accordance with mix designs submitted by Laboratory and approved by the Owner's Testing Agency. All concrete shall have at least 5 sacks of cement per cubic yard of mix.

B. Concrete shall have 3% +/- 1%, air entrainment when approved by Testing Agency.

C. Water reducing admixtures may be used in concrete when approved by Testing Agency. Such admixtures shall not interfere with or reduce required air content dosage of air-entrained concrete.

D. Use a minimum of 5 sacks of cement per cubic yard for all concrete.

E. Concrete Mix Requirements: The following table presents a schedule of elements of concrete, compressive strength in psi after 28-days when tested in accordance with ASTM C39, maximum aggregate and maximum slump, which shall be as follows:

Concrete Element	***Strength***	***Max. Size Aggregate (Inch)***	***Max. Slump (Inch)***
All Concrete	3000 psi	1"	4"

PART III – EXECUTION

3.1 Inspection

A. Areas in which concrete is to be placed shall be inspected by Contractor for defects which would prohibit satisfactory placement of concrete or related miscellaneous items. Such defects shall be corrected prior to commencement of work.

B. Concrete shall not be deposited or placed until all forms, reinforcing steel and construction joints have been inspected by Owner's Testing Agency and accepted in advance within the entire extent of the pour. Architect shall be notified 48 hours prior to first pour.

3.2 Field Quality Control

A. The Owner's Testing Agency will:

1. Review concrete mix designs.

2. Perform testing in accordance with ACI 318 and CBC Sections: 1903A and 1905A and 1910A.

3. Continuously monitor concrete temperature and inspect concrete placement.

4. Test concrete to control slumps according to ATSM C31 and ASTM C172.

5. Test concrete for required compressive strength in accordance with CBC Section 1905A:

a. Make and cure three specimen cylinders according to ATSM C31 for each 50 cubic yards per CBC 1905A, or fraction thereof, of each class poured at site each day.

b. Retain one cylinder for 7-day test and two for the 28-day test.

c. Number each cylinder 1A, 1B, 1C, 2A, 2B, 2C, etc; date each set; and keep accurate record of pour each set represents.

d. Transport specimen cylinders from job to laboratory after cylinders have cured for 24-hours on site. Cylinders shall be covered and kept at air temperatures between 60 and 80 degrees Fahrenheit.

e. Test specimen cylinders at age 7-days and age 28-days for specified strength according to ASTM C39.

f. Base strength value on average of two cylinders taken for 28-day test.

B. The Contractor shall:

1. Submit ticket for each batch of concrete delivered to job site. Ticket shall bear the following information:

a. Design mix number.

b. Signature or initials of ready mix representative.

C. Comply with Title 24, CBC Section 1904A

3.3 Workmanship

A. All concrete shall be placed, finished and cured, and all other pertinent construction practices shall be in accordance with the Specifications for Structural Concrete for Buildings (ACI 301) hereby made a part of these specifications.

B. In addition to the requirements of ACI 301, the following shall prevail:

1. Concrete shall be placed so that a uniform appearance of surface will be obtained.

2. The concrete shall be free of all rock pockets, honeycombs and voids.

3. Concrete shall be deposited as nearly as practical in its final position.

4. The sub-grade shall be slightly moist when the concrete is placed for floor slabs to prevent excessive loss of water from the concrete mix.

5. Place concrete within 90 minutes of mixing.

C. Vibrators and Vibrating:

1. Employ as many vibrators and tampers as necessary to secure the desired results. Minimum: one per each 20 cubic yards of concrete placed per hour.

2. Eliminate the following applications:

a. Pushing of concrete with vibrator.

b. External vibration of forms.

c. Allowing vibrator to vibrate against reinforcing steel where steel projects into green concrete.

d. Allowing vibrator to vibrate contact faces of forms.

3. Vibrators shall function at a minimum frequency of 3600 cycles per minute when submerged in concrete.

4. Supplement vibration by forking and spading along the surfaces of the forms and between reinforcing whenever flow is restricted.

D. Curing:

1. General: Freshly deposited concrete shall be protected from premature drying and excessively hot or cold temperatures and shall be maintained with minimal moisture loss at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete. Also comply with CBC Section 1905A.

2. Initial Curing: Initial curing shall immediately follow the finishing operation. Concrete shall be kept continuously moist at least over night. One of the following materials or methods shall be used:

   a. Ponding or continuous sprinkling.

   b. Absorptive mat or fabric kept continuously wet.

3. Final Curing: Immediately following the initial curing and before the concrete has dried, additional curing shall be accomplished by one of the following materials or methods:

   a. Continuing the method used in initial curing.

   b. Slabs to receive finish flooring materials to be continuously wet cured for 7 days.

   c. Waterproof paper conforming to “Specifications for Waterproof Paper for Curing Concrete” (ASTM C171).

   d. Curing compounds conforming to “Specifications for Liquid Membrane-Forming Compounds for Curing Concrete” (ASTM C309). Such compounds shall be applied in accordance with the recommendations of the manufacturer and shall not be used on any surfaces against which additional concrete or other cementitious finishing materials (such as ceramic tile) are to be bonded, nor on surfaces on which such curing is prohibited by the project specifications.

   e. Other moisture-retaining coverings as approved.

4. Duration of Curing: The final curing continue until the cumulative number of days or fractions thereof, not necessarily consecutive, during which temperature of the air in contact with the concrete is above 50 degrees F., has totaled 7 days.

5. Formed Surfaces: Steel forms heated by the sun and all wood forms in contact with the concrete during the final curing period shall be kept wet. If forms are to be removed during the curing period, one of the above curing materials or methods shall be employed immediately. Such curing shall be continued for the remainder of the curing period.

E. Construction Joints

1. Joints not shown on the drawing shall be so made and located as to least impair the strength of the structural element and shall be approved by the Owner and Structural Engineer.

2. The surfaces of all concrete at all joints shall be thoroughly cleaned and all laitance removed by sandblasting.

3. Concrete surfaces at designated joints shall be roughened to ¼" relief with roto hammer or similar method.

4. Moisten all joints immediately prior to placement of concrete.

F. Embedded Items:

1. All sleeves, inserts, anchors and embedded items required for adjoining work or for its support shall be placed prior to concreting. Embedded items shall be positioned accurately and supported against displacement. Voids in sleeves, inserts and anchor bolt slots shall be filled temporarily with a readily removable material to prevent entry of concrete into the voids.

G. Grouting Column Bases:

1. The grout shall be mixed and placed in strict accordance with manufacturer's instructions.

2. Care shall be taken in the grouting to insure that there is full bearing between the base plates and the grout.

3.4 Defective Work: Work considered to be defective may be ordered to be replaced, in which case the Contractor shall remove the defective work at his expense. Work considered to be defective shall include, but not be limited to, the following:

A. Concrete in which defective or inadequate reinforcing steel has been placed.

B. Concrete incorrectly formed, or not conforming to details and dimensions on the drawings or with the intent of these documents, or concrete the surfaces of which are out of plumb or level.

C. Concrete below specified strength.

D. Concrete containing wood, cloth or other foreign matter, rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings.

3.5 Correction of Defective Work

A. The Contractor shall, at his expense, make all such corrections as directed by the engineer.

B. Concrete work containing rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings shall be chipped out until all unconsolidated material is removed.

3.6 Slab Finish

A. Covered interior slabs shall receive a smooth, steel troweled finish. Tolerance shall be 1/8” in 10’-0”.

B. Slabs under ceramic tile shall receive a roughened finish.

C. Exposed interior & exterior slabs receive a broom finish as directed. Edges shall be smooth troweled. See drawings for specifics.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes removal of surface debris; removal of paving, curbs, sidewalks; removal of trees, shrubs, and other plant life; removal of underground storage tanks; and removal of abandoned utilities.

B. Related Sections:
1. Section 31 05 13 – Soils for Earthwork.
2. Section 31 22 13 - Rough Grading.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that existing plant life designated to remain is tagged or identified.

B. Removed materials are to be removed from the site and disposed of in a lawful manner.

3.2 PROTECTION

A. Locate, identify, and protect utilities from damage that are to remain.

B. Protect trees, plant growth, and features designated to remain.

C. Protect benchmarks, survey control points, and existing structures from damage or displacement.

3.3 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove trees and shrubs indicated and in a manner specified on the drawings or in these specifications. Remove tree and shrub root bulbs in their entirety and to a maximum root diameter of one inch.

3.4 REMOVAL

A. Remove debris, rock, and extracted plant life from site to the limits indicated on the drawings.

B. Remove paving, curbs, and concrete from the site to the limits indicated on the drawings.

C. Neatly saw cut edges at limits indicated for all pavement, curbs, and walkways to be removed.

D. Excavate and remove any underground storage tanks and associated plumbing piping, as indicated on the drawings.

3.5 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, without mixing with foreign materials for use in finish grading.

B. Stockpile on site and protect from erosion.

C. Remove excess topsoil not intended for reuse, from site.

END OF SECTION

SECTION 31 23 00
EXCAVATION AND FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section includes excavating for building foundations, roads, parking areas, site grading, slabs-on-grade, landscaping areas, and for site structures.

1.2 REFERENCES

A. The project Soils Report and any supplements to the Soils Report.

B. Local utility standards when working within 24 inches of the respective utility lines.

PART 2 PRODUCTS

1. Permeable Class II Aggregate Base or crushed drain rock.

2. Planting soil is 60% sand, 40% compost mix allowing 5”/hour percolation.

PART 3 EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

3.2 EXCAVATING

A. Underpin adjacent structures which may be damaged by excavating work.

B. Excavate subsoil to accommodate building foundations, slabs-on-grade, paving and site structures.

C. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 32 12 16 and 32 13 13

D. Slope banks with machine to angle of repose or less until shored.

E. Do not interfere with 45 degree bearing splay of foundations.

F. Grade top perimeter of excavating to prevent surface water from draining into excavation.

G. Hand trim excavation. Remove loose matter.

H. Remove lumped subsoil, boulders, and rock in accordance with the provisions of the Soils Report and any supplements to the Soils Report.

I. Notify Architect/Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.

J. Correct areas over excavated with backfill and compact replacement as specified for authorized excavation.

K. Remove excess excavated material from site.

3.3 FIELD QUALITY CONTROL

A. The project Soils Engineer shall provide testing and inspection services.

3.4 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

3.5 SUBMITTALS

A. Samples for testing lab to determine R-Value, Grading Report and Source

END OF SECTION

SECTION 32 11 23 - AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes aggregate base course.

B. Related Sections:
1. Section 03 30 00 – Concrete work
2. Section 32 12 16 - Asphalt Pavement.

PART 2 PRODUCTS

2.1 MATERIALS

A. Class II Aggregate Base per Caltrans Standard Specifications, or Local Municipality.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

C. Sidewalk Subgrade:

1. Remove material deflecting more than 2-inch under the roller to a depth of 4 inches below subgrade elevation and replace with an approved granular material.
2. Then compact new material at 95% relative compaction as per plan detail.
3. Test completed subgrade for grade and cross section with a template extending the full width of the sidewalk and supported between side forms.

D. Curb and Gutter Subgrade:

1. Provide subgrade of materials equal in bearing quality to the subgrade under the adjacent pavement.
2. Place and compact additional subgrade material as needed.
3. Test subgrade for grade and cross section by means of a template

extending the full width of the curb and gutter.

E. Maintenance of Subgrade:

1. Maintain subgrade in a smooth, compacted condition, in conformity with the required section and established grade until the concrete is placed.
2. Prepare and protect subgrade so as to produce a subgrade free from frost and excessive moisture when the concrete is deposited.

3.3 AGGREGATE PLACEMENT

A. Place aggregate in maximum 6-inch layers and compact to specified density.

B. Level and contour surfaces to elevations and gradients indicated.

C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10-foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation From Design Elevation: Within 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ASTM D1557.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to owner.

END OF SECTION

SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1.2 SUMMARY

A. Section Includes (but is not necessarily limited to):

1. Asphalt Concrete Paving.
2. Liquid Asphalt and Asphalt Emulsion.
3. Aggregate Base.
4. Fog seal coat
5. Prime coat

B. Related Work Furnished under other Sections but Conforming to the Provisions of this Section:

1. Subgrade preparation.
2. Aggregate Base installation.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. A615: Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
2. C150: Portland Cement.
3. D1557: Moisture Unit Weight Relations of Soils and Aggregate Mixtures Using a 10 lb (4.5 kg) Rammer and 18 in. (457 mm) Drop.
4. D1682: Breaking Loads and Elongation of Textile Fabrics.

B. California Code of Regulations (CCR): Title 24, Chapter 2-71, Site development Requirements for Americans with Disabilities Act Accessibility Guidelines (ADAAG).

C. California Department of Transportation (C.D.T.):

1. Traffic Manual.
2. Highway Design.

D. Institute of Transportation Engineers: Transportation and Traffic Engineering Handbook.

E. Project Geotechnical Engineering Study.

1.4 SUBMITTALS

A. Requirements: Refer to Submittals Section.

B. Asphalt Concrete Paving:

1. Provide two copies of material certificates signed by the material producer and the Contractor, certifying that each material item complies with or exceeds specified requirements.
2. The Contractor shall furnish a certified weight or load slip for each load of material used in the construction of the asphalt concrete pavement.

C. Concrete Paving: The Contractor shall furnish mill test reports on the cement, reinforcement bars, and aggregates, showing compliance with the respective specifications. The Testing Engineer may make concrete test cylinders and slump tests as deemed necessary to determine compliance with the Specifications.

D. Liquid Asphalt.

E. Paint.

F. Aggregate Base.

1.5 PROJECT CONDITIONS

A. Prior to placing asphalt concrete, or base fill material:

Verify that all underground utilities and drainage systems have been installed and backfilled.

B. Asphalt Concrete Paving: Asphalt concrete surfaces shall be constructed only when ambient temperature is above 50° F and when base is dry.

1.6 GENERAL DESIGN CRITERIA

A. Services Areas: Approach ramps, driveways, and paved work areas in excess of 4% slope shall be provided with a rough texture for non-skid surface.

B. Walks and Paths: Concrete exterior slabs (walks, terraces, etc.) shall be ADA compliant unless otherwise noted on the plans.

C. Crosslope not to exceed 2% in any direction.

PART 2 - PRODUCTS

2.1 PAVING MATERIALS

A. Aggregate Base: See 32 11 23 - Aggregate Base Course

B. Asphalt Concrete Paving:

1. Paving asphalt to be mixed with aggregate shall be steam-refined asphalt, AR-4000, conforming to Section 92 of the C.D.T. Standard Specifications.
2. Mineral aggregate shall be Type B mineral aggregate as specified in Section 39 of the C.D.T. Standard Specifications.
3. Maximum aggregate size shall be as follows:
   Asphalt Concrete: Caltrans Section 39.2, Type B using Type B aggregate with ½ inch maximum, medium grading and steam refined paving asphalt meeting requirements of Caltrans Section 92, Grade AR40000.
4. Liquid asphalt for prime coat shall be Grade SC-70 in conformance with Section 93 of the C.D.T. Standard Specifications.
5. Asphaltic emulsion for paint binder, fog coat, and seal coat shall be emulsified asphalt, Type SS-1h, conforming to Section 94 of the C.D.T. Standard Specifications.

C. Seal Coat: Caltrans Section 37-1, Fog Type using SS1 asphaltic emulsion.

2.2 SOURCE QUALITY CONTROL

A. Submit proposed asphalt mix design prior to commencement of work.

B. Asphalt Concrete Test Report and Certification.

1. Provide certified copies of the test report at the time of delivery of each shipment of asphalt.
2. The test report shall indicate:

   a. Name of the vendor.
   b. Type and grade of asphalt delivered.
   c. Date and point of delivery.
   d. Quantity delivered.
   e. Delivery ticket number.
   f. Purchase order number.
   g. Results of the specified tests.

3. Provide certified test report that the product delivered conforms to the Specifications for the type and grade indicated.
4. The certified test reports and the testing required in connection with the reports shall be at no additional cost to the owner.

5. Final acceptance will be dependent upon the determination by the Client's Representative that the material involved fulfills the prescribed requirements.

C. Certificates: Provide the Client's Representative with a material certificate signed by the material producer and the Contractor, certifying that each material item complies with, or exceeds specified requirements.

D. Obtain materials from same source throughout duration of Project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive asphalt concrete and verify the following.

1. Related work as drainage structures, grates, frames, curbs, headers, and adjacent paving have been set at proper elevations or that conditions will permit adjustments to proper elevations.
2. Receiving surfaces are not wet.
3. Other conditions that adversely affect execution of this work.

B. Do not start work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Subgrade and Aggregate Base:

1. The top 8 inches of subgrade shall scarified and compacted to 90% percent based on ASTM D1557 laboratory Compaction Test Procedure.
2. Ensure receiving areas are true to line and grade, dry, firm, properly prepared, and free from loose or foreign materials.
3. Do not proceed until subgrade has been inspected and approved by the Client's Representative. Notify Client's Representative 48 hours in advance of performing paving work.

B. New to existing joint sealing:

1. Before sealing, joints shall be cleared of dirt, dust, and all other deleterious materials to a depth of 1/4" to 1/2".
2. Application of sealer shall be in accordance with the manufacturer's recommendations unless otherwise directed.

3.3 ASPHALT CONCRETE PAVING INSTALLATION

A. Aggregate Base: See 32 11 23 - Aggregate Base Course

B. Prime Coat: Before placing Asphalt concrete on untreated base, a liquid asphalt prime cast shall be applied at rate of 0.25 gallons per square yard to entire area in accordance with Caltrans Section 39-4.02.

C. Prime Coat: Supply at rate of 0.05 to 0.10 gallon per square yard to all vertical surfaces of curbs, gutters, and construction joint in surfacing against which additional material is to be placed in accordance with Caltrans Section 39-4.02.

D. Asphalt Concrete:

1. Proportion, mix, place, spread and compact asphalt concrete in layers in conformance with Section 39 of the Caltrans Standard Specifications.
2. Use a minimum of 8-ton self-propelled rollers.
3. No layer of asphalt concrete shall be less than 1 inch in compacted thickness or shall the layer exceed the maximum thickness allowed in Section 39.
4. Provide smooth side and water-resistant surface, true within tolerances specified, and free of bird baths.
5. Bring asphalt concrete to edges or concrete curbs, gutters, adjacent paving, and header boards; do not overlap these items.
6. Roll surfaces longitudinally; cross-rolling will be required where space permits.

E. Existing Asphalt Concrete Paving:

1. Repair damage caused by construction operations and restore to condition prior to construction.
2. Restoration may be accomplished by patching defects, resurfacing, completely replacing, or combination of these measures, but measure taken shall be adequate for work of restoration required and is subject to the Client's Representative's prior approval.

F. Bituminous concrete shall show no evidence of cracking, uneven settlement or improper drainage. All correct work will display such conditions under the Contractor's warranty.

3.4 PAVEMENT MARKING

A. General:

1. New surfaces shall have traffic paint applied in two applications. First or priming coats shall be in light application to seal the pavement. Second heavier coat of paint is the wearing surface and the rates of application are shown on Table 1. Restriping may be in one application.
2. Surfaces to be painted shall be clean and dry prior to painting. Ample time shall be allowed between the asphalt pavement seal coat and the initial painting application. Usually, the drying time of the seal coat is approximately three to four days, depending upon weather conditions. There shall be a minimum drying time between paint applications of approximately 20 minutes.

TABLE 1

SOLID STRIPES	
New Surfaces (first coat)	12 - 14 gallons per mile or one gallon per 125 - 150 s.f. of line
Second Coat or Restriping	16 - 18 gallons per mile or one gallon per 100 - 110 s.f. of line
BLACK TRAFFIC PAINT	One gallon per 220 s.f. of line (Quantity pertains to black line painted between parallel solid yellow line-not for painting out existing striping).
PAVEMENT MARKINGS	
New surface (first coat)	Approximately 1 gallon per 200 s.f. of area.
Second coat or restriping	1 gallon per 100 s.f. of area

3.5 FIELD QUALITY CONTROL

A. General: Test in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Engineer.

B. Aggregate Base: The surface of finished aggregate base shall vary by no more than 0.05 feet above or below the grade established as shown on the plans.

C. Asphalt Concrete Paving:

1. The finished asphalt pavement, where not controlled by adjacent structures or features, shall not vary more than 0.05 feet above or below the planned grade, providing it is uniform and free of sharp breaks.
2. The cross section of the finished pavement shall be free of ridges and valleys and shall not vary more than 0.03 feet above or below the theoretical section at any point on the cross section.
3. The specified thickness of the finished pavement shall be the minimum acceptable.
4. Conforms shall form a smooth, pond-free transition between existing and new pavement.

D. Depressions in paving between high spots are not to exceed 1/8" when measured below a 10' long straight edged placed anywhere on surface in any direction.

3.6 PROTECTION

A. Permit no traffic until surface of paving has cooled sufficiently to prevent damage.

B. Erect barricades if required to protect paving from traffic.

3.7 CLEANUP

A. General:

1. Surplus material remaining upon completion of paving operations shall become the property of the Contractor, to be removed from the work site and disposed of in a lawful manner.
2. Surfaces shall be left in a clean, neat, and workmanlike condition, and all construction waste, rubbish, and debris shall be removed from the work site and disposed of in a lawful manner.

END OF SECTION 32 12 16

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes concrete sidewalks

1.2 REFERENCES

A. ACI 304 (American Concrete Institute) - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

B. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

C. ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

D. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

E. ASTM C33 - Concrete Aggregates.

F. ASTM C94 - Ready Mix Concrete.

G. ASTM C150 - Portland Cement

H. ASTM C260 - Air-Entraining Admixtures for Concrete.

I. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

J. ASTM C494 - Chemical Admixtures for Concrete.

K. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

L. ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.3 QUALITY ASSURANCE

A. Obtain cementitious materials from same source throughout.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees, or surface is wet or frozen.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Wood or Steel form material, profiled to suit conditions.

B. Joint Filler: ASTM D1751.

2.2 REINFORCEMENT

A. Reinforcing Steel: ASTM A615; Grade 60 deformed billet steel bars; unfinished.

B. Welded Steel Wire Fabric: Plain type, ASTM A185 in flat sheets or coiled rolls; unfinished.

C. Dowels: ASTM A615; plain steel, unfinished.

2.3 CONCRETE MIX - BY PERFORMANCE CRITERIA

A. Provide concrete to the following criteria:
1. Compressive Strength: 3000 psi @ 28 days.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade or granular base is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.2 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete pavement.

C. Notify Architect/Engineer minimum 24 hours prior to commencement of concreting operations.

3.3 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.4 REINFORCEMENT

A. Place reinforcement as indicated on drawings.

B. Interrupt reinforcement at expansion joints.

C. Place reinforcement to achieve pavement and curb alignment as detailed.

3.5 PLACING CONCRETE

A. Place concrete in accordance with Caltrans Standard Specifications.

B. Ensure reinforcement, inserts, embedded parts, formed joints and are not disturbed during concrete placement.

C. Place concrete continuously over the full width of the panel and between predetermined construction joints.

D. Place concrete to pattern indicated on drawings.

3.6 JOINTS

A. Place expansion and contraction joints to align with existing curb, gutter, and sidewalk joints.

B. Place joint filler between paving components and building or other appurtenances. Recess top of filler 1/4 inch for sealant placement.

C. Provide scored sawn joints between sidewalks and curbs.

3.7 FINISHING

A. Sidewalk Paving: Light broom, slip resistant finish, perpendicular to path of travel and trowel joint edges.

B. Curbs and Gutters: Light broom in direction of flow.

C. Direction of Texturing: Transverse to pavement direction.

D. Place curing compound on exposed concrete surfaces immediately after finishing.

3.8 JOINT SEALING

A. Separate pavement from vertical surfaces with thick joint filler.

B. Place joint filler in pavement pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

C. Extend joint filler from bottom of pavement to within 1/8 inch of finished surface. Conform to joint sealer manufacturer requirements.

3.9 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 feet.

B. Maximum Variation From True Position: 1/2 inch.

3.10 FIELD QUALITY CONTROL

A. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.11 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian or vehicular traffic over pavement for 7 days minimum after finishing.

END OF SECTION

SECTION 32 15 40 – Crushed Stone Surfacing

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. The extent of work in this Section includes the provision and installation of the following paving materials, base foundations and appurtenances required for installation.

B. The general extent of work for this Section is shown on the drawings and includes, but is not limited to, the following:

1. Decomposed Granite.

1.3 QUALITY ASSURANCE:

A. All manufactured items shall be inspected and approved upon delivery.

B. Protect from damage and intrusion of deleterious materials during delivery, handling, storage, and installation.

1.4 SUBMITTALS:

A. Contractor shall submit a one (1) quart sample indicating variation of size and color of stone paving to be installed.

B. Contractor shall submit photographic image of large boulders to be installed.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Store stone paving material in a secure location. Coordinate with General Contractor for available stockpile location.

1.6 PROJECT CONDITIONS:

A. Protection of Work: Protect work from trespass until mortar has cured.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Decomposed Granite: Shall be California Gold fines, or equal, gold color and shall consist of crushed aggregate screenings free from clay lumps, vegetable matter and deleterious material. The portion retained on the No. 4 sieve shall have a maximum percentage of wear of 50 at 500 revolutions as determined by AASHTO T96-77. The portion passing a No. 40 sieve shall have a maximum liquid limit of 25 and a maximum plasticity index of 7, as

determined by AASHTO T89-81 and AASHTO T90-81. California Gold Decomposed granite available from Felton Quarry at (408) 335-3445.

B. Decomposed Granite Soil Binder: Organic soil binder shall be Stabilizer, or equal, consisting of non-toxic, colorless, odorless, organic powder from crushed seed hulls produced to bind decomposed granite or crushed 3/8" or ¼" minus aggregate screenings by Stabilizer Solutions, Inc. (602) 225-5900, www.stabilizersolutions.com.

C. Decomposed Granite Headerboard: Redwood header shall be construction heart redwood lumber, size per detail. Wood support stakes to be 2" by 2" by 16" length, nominal size. Use galvanized nails sized so as not to split wood and quantity as required to anchor edging securely in place.

D. Decomposed Granite Aggregate Base: Shall be coarse aggregate for regular weight concrete. Aggregate shall be hard, durable, uncoated, graded, cleaned and screened crushed rock or gravel conforming to Class II aggregate base per Caltrans Standard Specifications. Crusher-run stone or bank-run gravel will not be permitted.

E. Filter Fabric: Mirafi 140N Non-Woven Polypropylene Geotextile fabric for separation and drainage.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Preparation:

1. Grade and compact subgrade.

B. Aggregate Base Rock Placement:

1. Place aggregate in maximum 6-inch layers and compact to 95% relative density.
2. Level and contour surfaces to elevations and gradients indicated.
3. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
4. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
5. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

C. Decomposed Granite Redwood Headerboard:

1. Layout perimeter edging as shown on drawing with smooth, continuous transitions horizontally and vertically.
2. Where landscape edging contacts adjacent paved surface, top of edging shall terminate flush with top of adjacent paving material.
3. Top of landscape edging shall be installed ½" above finish grade in turf areas, 1" above finish grade in shrub planting areas and flush with surface of decomposed granite fines.
4. Install per detail on drawings.

D. Filter Fabric (weed barrier):

1. Place weed barrier product throughout the proposed paving area, covering soil surface with edges over-lapping six (6) inches.
2. Staple to hold in place prior to placing decomposed granite.

E. Decomposed Granite:

1. Blending organic soil binder with decomposed granite:
   a. Blend 12 to 16 pounds (confirm with manufacturer for exact blend for particular application) of soil binder per 1-ton of decomposed granite or crushed 3/8" or ¼" minus aggregate screenings.
   b. Thoroughly and uniformly mix soil binder throughout decomposed granite or crushed 3/8" or ¼" minus aggregate screenings.
   c. Bucket blending is not acceptable. Blending with a rake and/or shovel is not acceptable.
   d. Blend material dry. Water will make material hard.
2. Install decomposed granite fines to a minimum depth of four inches, unless shown otherwise on details and drawings.
3. Install material in two-inch lifts.
4. Thoroughly water to compact each lift until the entire depth is moist.
5. Compact to 90% relative density after grading and wetting final lift.
6. Allow material to dry, then spike and mat drag to obtain the desired finish.
7. Note that precise grading is critical and is best accomplished with laser-equipped machinery.
8. At end of landscape maintenance period, re-apply decomposed granite to areas that have settled and smooth surface to uniform plane, flush with adjacent finish grade elevations.

END OF SECTION

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SECTION 32 17 00
PAVEMENT SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Parking lot striping.
B. Disabled loading zone striping and disabled parking symbol.
C. Traffic symbols.
D. Curb painting.
E. Traffic and parking control signage.

1.3 QUALITY ASSURANCE

A. Materials and work of this section shall conform with Local Municipality Public Works standards and specifications.

1.4 REGULATORY REQUIREMENTS

A. Conform to regulations of Bay Area Air Quality Management District and California Air Resources Board regarding use of paint.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do no painting when surface and air temperatures are below 40 degrees F or below those temperatures recommended by the paint manufacturer.

PART 2 PRODUCTS

2.1 STANDARD CATALOG PRODUCTS

A. Symbol Marking Paint and Traffic Marking Paint: Water borne product conforming to State Specification 8010-426-30; Dunn-Edwards Traffic Paint W801, Sinclair 160 Vinyl Traffic Paint, or equal product.

1. ISA Symbol Background: Color - Blue. Size: As indicated in the drawings.

2. Parking Stall Striping, Traffic Symbols and Disabled Loading Zone Striping and Lettering: Color - White. Width for all striping: Three inches, or as indicated in the drawings. Blue border around access aisle. Striping surface shall be as slip resistant as the adjacent surfaces.

3. Disabled Stall Curbs: Color - Blue. Width for all striping: Three inches, or as indicated in the drawings.

4. Sport Court Striping: Color - White.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine receiving surfaces and verify that surfaces are proper for installation.

B. Do not start work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove dirt, oil, grease, and other foreign matter from the areas of the pavement and curbs to be painted.

B. Do not apply traffic paint to surfaces which are excessively dirty, damp, and cold.

3.3 INSTALLATION

A. Apply parking lot as a 4 inch wide solid line. Apply loading zone striping as 8 inch wide solid line.

B. Stripe parking stalls to the dimensions as shown on the Drawings; traffic symbols shall be as shown. Stripe loading zone to dimensions shown on Drawings.

C. Paint the ISA parking symbol in each accessible parking stall as indicated on the Drawings and in accordance with the American National Standard Institute Figure A117.1.

D. Paint horizontal and vertical face of curbs abutting accessible parking stalls. See Drawings for extent of painted curbs.

E. Apply traffic paint with atomizing spray type striping machine equipped with separate thermostatically controlled heating devices for each paint pot and capable of applying paint whereby the lines and markings have clear-cut edges, true and smooth alignments and uniform thicknesses.

F. Apply paint with completed lines and marking clean, sharp and to dimensions.

1. Ragged ends of segments, fogginess along the sides or objectionable dribbling of paint along the unpainted portions of the strips will not be permitted.

2. The finished paint shall have an opaque, well painted appearance with no black or other discolorations showing through.

G. Set posts for parking sign plumb in minimum 12 inch diameter concrete footings with top of footing 6 inches below finished grade and bottom of footing minimum 36 inches below finished grade. Slope top of concrete for water runoff. Cap top of pipe.

H. Secure signs to posts with saddles and vandal-proof nuts.

I. Install parking control signs with bottom of upper sign 60 inches above finished grade. Install accessible parking signs with bottom of upper sign 80 inches above finished grade. Install lower signs in two sign assemblies with top within 1 inch of bottom of upper sign.

3.4 PROTECTION

A. Exercise reasonable precautions to protect the paint, as applied, during drying time.

Remove objectionable tracking.

END OF SECTION

SECTION 32 31 13 - CHAIN-LINK FENCING AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Chain-Link Fences: Industrial.
2. Gates: Horizontal slide and swing.

B. Related Sections include the following:

1. Division 31 Section "Earthwork" for site excavation, fill, and backfill where chain-link fences and gates are located.

1.3 SUBMITTALS

A. Product Data & Shop Drawings: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.

1. Fence and gate posts, rails, and fittings.
2. Chain-link fabric, reinforcements, and attachments.
3. Gates and hardware.
4. All types of post footings and integral headers.

B. Samples for Initial Selection: Manufacturer's color charts or 6-inch lengths of actual units showing the full range of colors available for components with factory-applied color finishes.

C. Product Certificates: For each type of chain-link fence, and gate, signed by product manufacturer.

1. Strength test results for framing according to ASTM F 1043.

D. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chain-Link Fences and Gates:

a. Allied Tube and Conduit Corporation
b. American Fence Corporation
c. Anchor Fence, Inc.
d. United States Steel

2.2 CHAIN-LINK FENCE FABRIC

A. General: Height indicated on Drawings. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:

1. Steel Wire Fabric: Metallic coated wire, 9 gauge (0.148” in diameter).

a. Mesh Size: 2 inches.
b. Weight of Metallic (Zinc) Coating: ASTM A 392, Type II, Class 2 oz./sq. ft. with zinc coating applied after weaving.
c. Coat selvage ends of fabric that is metallic coated before the weaving process with manufacturer's standard clear protective coating.
d. Furnish one piece fabric widths for fencing up to 12 feet high.

2. Selvage: Knuckled at both selvages.

2.3 INDUSTRIAL FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:

1. End, Corner and Pull Posts - Up to 6 foot fabric height: 2.375” OD steel pipe, 3.65 lbs. Per lin. Ft., or 3.5” x 3.5” roll formed sections, 4.85 lbs. per lin. ft.

2. End, Corner and Pull Posts – Over 6 foot fabric height: 2.875" OD steel pipe, 5.79 lbs. Per lin. Ft., or 3.5" x 3.5" roll formed sections, 4.85 lbs. per lin. ft.
3. Line Posts – Up to 6 foot fabric height: 1.90: OD steel pipe, 2.70 lbs. per lin. ft., or 1.875" x 1.625" C- sections, 2.28 lbs. per lin. ft.
4. Line Posts – Over 6 foot to 8 foot fabric height: 2.375" OD steel pipe, 3.65 lbs. per lin. ft., or 2.25" x 1.875" H-sections, 2.64 lbs. per lin. ft.
5. Line Posts – Over 8 foot fabric height: 2.875" OD steel pipe, 5.79 lbs. per lin. ft., or 2.25" x 1.875" H-sections, 3.26 lbs. per lin. ft.
6. Top, Intermediate, & Bottom Rails: 1.66" OD steel pipe, 2.27 lbs. per lin. ft., or 1.625" x 1/25" roll-formed sections, 1.35 lbs. per lin. ft.

B. Swing Gate Post: Furnish posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:

1. Leaf width up to 6 feet: 2.875" OD steel pipe, or 3.5" x 3.5" roll formed, 4.85 lbs. per lin. ft.
2. Leaf width over 6 feet to 13 feet: 4.00" OD steel pipe, 5.79 lbs. per lin. ft.
3. Leaf width over 13 feet to 18 feet: 6.625" OD steel pipe, 18.97 lbs. per lin. ft.
4. Leaf width over 18 feet: 8.625" OD steel pipe, 28.55 lbs. per lin.ft.

C. Coating for Steel Framing:

1. Metallic Coating:

a. Type A, consisting of not less than minimum 2.0-oz./sq. ft. average zinc coating per ASTM A 123/A 123M or 4.0-oz./sq. ft. zinc coating per ASTM A 653/A 653M.

2.4 INDUSTRIAL SWING GATES

A. General: Comply with ASTM F 900 for single and double swing gate types.

1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1043 and ASTM F 1083 for materials and protective coatings.

B. Frames and Bracing: Fabricate members from round, galvanized steel tubing with outside dimension and weight according to ASTM F 900 and the following:

1. Gate Fabric Height: 2 inches less than adjacent fence height.
2. Leaf Width: As indicated.
3. Frame Members: Tubular Steel: 1.90 inches round.
4. Gate frames shall be hot dipped galvanized after fabrication.

C. Frame Corner Construction:

1. Welded or assembled with corner fittings and rivets, and 3/8-inch diameter, adjustable truss rods for gate panels.

D. Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A153, and in accordance with the following:

1. Latches, forked type or plunger-bar type permitting operation from both sides of gate, hinges, center gate stops and keepers for each gate leaf more than 5 feet wide. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.
2. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180 degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 6 foot nominal height.
3. Keeper: Provide keeper for vehicle gates, which automatically engages gate leaf and holds it open position until manually released.
4. Double Gates: Provide gate stops for double gates, consisting of mushroom type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with a single padlock.

2.5 FITTINGS

A. General: Comply with ASTM F 626.

B. Post and Line Caps: Provide for each post.

1. Line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: Attach rails securely to each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails in the fence line-to-line posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post. Bars shall be 3/16” x ¾”.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.

1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:

a. Hot-Dip Galvanized Steel: 0.148-inch diameter wire**;** galvanized coating thickness matching coating thickness of chain-link fence fabric.

I. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. zinc.

2.6 CAST-IN-PLACE CONCRETE

A. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM C 33, and potable water. Measure, batch, and mix Project-site-mixed concrete according to ASTM C 94/C 94M.

1. Concrete Mixes: Normal-weight concrete**,** 2%to 4% air entrained with not less than 3000-psi compressive strength (28 days), 3-inch slump, and 1-inch maximum size aggregate.

B. Materials: Dry-packaged concrete mix complying with ASTM C 387 for normal-weight concrete mixed with potable water according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries**,** site clearing, earthwork, pavement work, and other conditions affecting performance.

1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

1. Install fencing on established boundary lines inside property line or as indicated.

3.4 CHAIN-LINK FENCE INSTALLATION

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

1. If diameter is not indicated, excavate holes for posts to diameters as recommended by manufacturer, but not less than 4 times the largest cross section of post.

B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Extend concrete 2 inches above grade; shape and smooth to shed water. Protect aboveground portion of posts from concrete splatter.
3. Center and align posts in holes 3 inches above bottom of excavation.

C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.

D. Line Posts: Space line posts uniformly at 10 feet o.c. maximum.

E. Post Tops: Provide weather tight closure cap with loop to receive top rail. One cap for each post.

F. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 6 feet or higher, on fences with top rail. Install so posts are plumb when diagonal rod is under proper tension.

G. Top & Intermediate Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

H. Bottom Rails: Install, spanning between posts. Maintain consistent distance to finished grade unless otherwise specified in drawings.

I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2 inches between finish grade or surface and bottom selvage (except at Tennis Courts, which shall be 1 inch), unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c. At gates, install fabric with stretcher bars at vertical edges and top and bottom edges. Attach stretcher bars to gate frame at not more than 15 inches o.c.

K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.5 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

1. Tack weld all gate hinges to gate posts after installing to posts with fasteners. Welds shall be 3/8” long minimum, in four locations per hinge, two on each side. Clean and touch up welds with cold galvanizing paint.

3.6 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

END OF SECTION 32 31 13

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SECTION 32 31 19.10 – ORNAMENTAL STEEL FENCING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Decorative ornamental galvanized metal tubular picket fence system.
B. Related Sections:
   1. Division 03 Concrete
   2. Division 31 Earthwork

1.3 REFERENCES

A. American Society for Testing Materials:
   1. A239 Practice for Locating the Thinnest Spot in a Zinc(Galvanized) Coating on Iron or Steel Articles
   2. A653/A653M Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy- Coated (Galvannealed) by the Hot-Dip Process
   3. A1008/A1008M Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High- Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
   4. A1011/A1011M Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low- Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
   5. B117 Practice for Operating Salt Spray (Fog) Apparatus
   6. D523 Test Method for Specular Gloss
   7. D714 Test Method for Evaluating Degree of Blistering of Paints
   8. D1654 Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
   9. D2244 Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
   10. D2794 Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
   11. D3359 Test Methods for Measuring Adhesion by Tape Test
   12. E4 Practices for Force Verification of Testing Machines
   13. F2814 Guide for Design and Construction of Ornamental Steel Picket Fence Systems for Security Purposes
   14. F2408 Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets

1.4 SUBMITTALS

A. Product Data: Manufactures information for each type of product indicated.
B. Shop Drawings: Product elevations, sections, and details as necessary.
C. Product Warranty: Pickets, Posts, and Rails standard limited warranty that ornamental fence system is free from defects in material and workmanship including cracking, peeling, blistering and corroding for a period of 15 years from the date of purchase.

1.5 QUALITY ASSURANCE

A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and the materials and techniques specified.
B. Provide complete fence system and gates, with all components provided by a single manufacturer, including all panels, posts, gates, fittings and hardware.
C. Manufacturer Qualifications: Company specializing in manufacturing of steel ornamental picket fence systems with a minimum of 5 years documented experience.

1.6 PRODUCT HANDLING AND STORAGE

A. Panels, gates, posts, and accessories to be delivered to the project site assembled and coated. Upon receipt at the job site, all materials shall be checked to ensure that no damages occurred during shipping.
B. Materials shall be handled and stored properly to protect against damage, weather, vandalism and theft.

PART 2 – PRODUCTS

2.1 TANGO RAIL® COMMERCIAL DECORATIVE ORNAMENTAL STEEL FENCE

A. A. Approved manufacture: Merchants Metals®
Phone: (888) 260-1600 Fax: (888) 261-3600
B. Products from other qualified manufacturers who have ten years or more experience manufacturing steel ornamental picket fencing will be considered by the architect as equal if approved in writing 10 days prior to biddings, and they meet all specifications for design, size, and gauge of metal parts and fabrication. Picket fences and gates must be obtained from a single source.
C. Biasable fence system shall rack 45 degrees based on an 8’ nominal panel if required.
D. Style: Kent, 3-rail
E. Nominal height: Custom 7’-0”
F. Width: 8’-0” nominal O.C. (actual 91-3/4" face to face of post).
G. Pickets: Galvanized steel tubular members manufactured per ASTM F2408, with a minimum yield strength of 45,000 psi.
H. Minimum picket size: 3/4” square, 16 gauge with pickets spaced 4-5/8” on-center and 3-7/8” face to face of picket.
I. Rails: 1-3/8” x 1-1/2”, double-walled 18 gauge “U” channel rail with a 13 gauge effective wall thickness 0.096”, galvanized steel per ASTM A-653/A-653M, having a 50,000 psi yield strength and a G90 zinc coating, 0.90 oz/ft^2 , No-Visible Fasteners, Good-neighbor appearance, equally attractive from either side of panel. Punched rails to receive pickets.
J. Posts: Galvanized square steel tubular members manufactured per ASTM F2408, having minimum yield strength of 45,000 psi.
K. Finish: Manufactured in compliance with ASTM F2408 - Corrosion Resistance Salt Spray Test per ASTM B117, Impact Resistance per ASTM D2794, and Adhesion per ASTM D3359 Method B.
L. All primary components shall receive a thorough cleaning and pre-treatment with a 10-step process: Hot alkaline cleaner, clear water rinse, hot iron phosphate application, clear water rinse, reverse Osmosis rinse, dry off oven heat, zinc enriched powder primer coat at 2-4

mils., gel oven heat, Ultra polyester finish T.G.I.C. powder coat at 2-4 mils., and final curing oven.

M. Color: Black.

2.2 ACCESSORIES

A. Industrial (Double Shaft) spring plungers hold pickets to rails, and have a sheer strength of 2,500 lbs.
B. Rail/Post Brackets:
    1. Universal Bracket - biasable up and down.
C. Post Caps: Cast aluminum or malleable iron or formed steel manufactured to form a weather-tight closure. Cap style: Flat tops - on all posts..

2.3 GATES

A. Ornamental picket pre-hung gates (see section 32 31 19.30)

2.4 SETTING MATERIALS

A. Concrete: Minimum 28 day compressive strength of 3,000 psi.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify areas to receive fencing are completed to final grades and elevations.
B. Property lines and legal boundaries of work to be clearly established by the general contractor or property owner.

3.2 FENCE INSTALLATION

A. Install fence per manufacturer's recommendations.
B. Space posts uniformly at manufactures standard face to face of post dimension unless instructed otherwise.
C. Set posts in concrete. See plans for footing dimension and embedment.
D. Attach brackets using 1/4" bolts with lock nuts. Attach panels and place tops on bracket. Rivet top to bracket in 2 places to assure security.

3.3 CLEANING

A. Clean up debris and remove from the site.

END OF SECTION 32 31 19.10

SECTION 32 31 19.30 - ORNAMENTAL PRE-HUNG GATES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Tuf-Guard® Decorative Ornamental Pre-Hung Gates with galvanized metal tubular square pickets, Chain link fabric, Tuf-Grid® Welded wire, or other – factory assembled – ready to install.

B. Related Sections:

1. Division 03 Concrete
2. Division 31 Earthwork
3. Section 32 31 19.10 – Ornamental Steel Fencing

1.3 REFERENCES

A. American Society for Testing Materials:

1. A239 Practice for Locating the Thinnest Spot in a Zinc (Galvanized) Coating on Iron or Steel Articles
2. A653/A653M Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy- Coated (Galvannealed) by the Hot-Dip Process
3. A1008/A1008M Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High- Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
4. A1011/A1011M Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low- Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
5. B117 Practice for Operating Salt Spray (Fog) Apparatus
6. D523 Test Method for Specular Gloss
7. D714 Test Method for Evaluating Degree of Blistering of Paints
8. D1654 Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
9. D2244 Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
10. D2794 Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
11. D3359 Test Methods for Measuring Adhesion by Tape Test
12. E4 Practices for Force Verification of Testing Machines
13. F2814 Guide for Design and Construction of Ornamental Steel Picket Fence Systems for Security Purposes
14. F2408 Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets.

1.4 SUBMITTALS

A. Product Data: Manufactures information for each type of product indicated.

B. Shop Drawings: Product elevations, sections, and details as necessary.

1.5 QUALITY ASSURANCE

A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and the materials and techniques specified.
B. Provide complete fence system and gates, with all components provided by a single manufacturer, including all panels, posts, gates, fittings, and hardware.
C. Manufacturer Qualifications: Company specializing in manufacturing of steel ornamental picket fence systems with a minimum of 5 years documented experience.

1.6 PRODUCT HANDLING AND STORAGE

A. Panels, gates, posts, and accessories to be delivered to the project site assembled and coated. Upon receipt at the job site, all materials shall be checked to ensure that no damages occurred during shipping.
B. Materials shall be handled and stored properly to protect against damage, weather, vandalism, and theft.

PART 2 – PRODUCTS

2.1 GUARDSMAN® COMMERCIAL DECORATIVE ORNAMENTAL SWING GATES

A. Approved manufacture: Merchants Metals®
Phone: (888) 260-1600 Fax: (888) 261-3600

B. Products from other qualified manufacturers: Shall have ten years or more experience manufacturing steel ornamental picket fencing will be considered by the architect as equal if approved in writing 10 days prior to biddings, and they meet all specifications for design, size, gauge of metal parts, and fabrication. Picket fences and gates must be obtained from a single source.
C. Gate frame: Galvanized steel tubular members manufactured per ASTM F2408, with a minimum yield strength of 45,000 psi; with minimum 2” square 14 gauge per ASTM F900.
D. Gate Height: 7’-0”
E. Gate Width: See Drawings.
F. Panel Design:
    (A) Ornamental Pickets: Galvanized steel tubular members manufactured per ASTM F2408, with a minimum yield strength of 45,000 psi.
        1. Minimum Commercial picket size:
            a. 3/4” square, 16 gauge with pickets spaced 4-5/8” on-center and - 3-7/8” face to face of picket.
        2. Attach pickets to "U" channel with 1/4" industrial drive rivets.
            a. Rails: 1-3/8” x 1-1/2”, 11 gauge galvanized steel “U” channel, shall conform to the requirements F2408 Sect 5.1.2 galvanized prior to forming, with a minimum yield strength of 50,000 psi., the steel shall be hot-dip galvanized to meet A653/A653M with a minimum zinc coating weight of 0.9 oz./ft2, Coating Designation G-90. Punched rails to receive pickets.
            b. Monroe style: Three rail.
    (B) Expanded Metal:

1. 16 gauge galvanized Expanded Metal 1/2” or 3/4" diamond mesh.

C. Posts: Galvanized square steel tubular members manufactured per ASTM F2408, having minimum yield strength of 45,000 psi; with minimum post size per ASTM F900.
   1. Gate Panel up to 8’-6” Height:
      a. Gate Panel Width up to 5’- 0” post shall be 3” square; 12 gauge.
      b. Gate Panel Width up to 10’-0” post shall be 6” square; Schedule 40.

F. Hardware:
   1. Pressed steel hinges shall be securely attached to post to prevent slippage and allow gate leaf to swing 180°.
   2. CRO 524P23SPU-S Cane bolt with spring hold up or hold down assembly. One per leaf.
   3. DDT BLK Lokklatch Pro-SL for single gates. By gate fabricator for double gates.

G. Finish: Manufactured in compliance with ASTM F2408 - Corrosion Resistance Salt Spray Test per ASTM B117, Impact Resistance per ASTM D2794, and Adhesion per ASTM D3359 Method B.
   All primary components shall receive a thorough cleaning and pre-treatment with a 10-step process: Hot alkaline cleaner, clear water rinse, hot iron phosphate application, clear water rinse, reverse Osmosis rinse, dry off oven heat, zinc enriched powder primer coat at 2-4 mils., gel oven heat, Ultra polyester finish T.G.I.C. powder coat at 2-4 mils., and final curing oven.
   1. Color for all components : Black.

2.2 ACCESSORIES

A. Industrial drive rivets hold pickets to rails and rails are securely welded to gate frame. Rivets must have a sheer strength of 1,500 lbs. and a holding power of 1,100 lbs.

B. Post Caps: Cast malleable iron or formed steel welded to uprights.
   1. Cap style: flat tops – on all uprights.

2.3 SETTING MATERIALS

A. Concrete: Minimum 28 day compressive strength of 3,000 psi.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify areas to receive gate are completed to final grades and elevations.

B. Property lines and legal boundaries of work to be clearly established by the general contractor or property owner.

3.2 GATE INSTALLATION

A. Install Pre-hung Gate manufactured with a welded brace below grade to help prevent shipping damages.
B. Attach all hardware to gate in such a way that it cannot be removed by unauthorized persons.
C. Set posts in concrete. See plans for footing dimension and embedment.

3.3 CLEANING

A. Clean up debris and remove from the site.

END OF SECTION 32 31 19.30

SECTION 32 84 00 - PLANTING IRRIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. Provide complete, automatically controlled, spray sprinkler, turf rotor, bubbler and/or drip underground irrigation system as shown on Drawings.

B. This Section includes but is not limited to: excavating, backfilling, finish grading, piping, valves, sprinklers, specialties, controls, and wiring for automatic control irrigation system.

C. Related Sections include the following:

1. 32 90 00 Planting.
2. 32 92 00 Turf Planting.
3. 32 91 00 Temporary Tree and Plant Protection.

1.3 DEFINITIONS

A. Certified Landscape Irrigation Auditor (CLIA): a person certified to perform landscape irrigation audits by the Irrigation Association Certification Board.

B. Lateral (Circuit) Piping: Downstream from control valves to sprinklers, rotors, emitters and specialties. Piping is under pressure during flow.

C. Mainline Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

D. The following are industry abbreviations for plastic materials:

1. ASME: American Society of Mechanical Engineers.
2. ASTM: American Society for Testing and Materials.
3. AWG-UF: American Wire Gauge - Underground Feeder
4. NFPA: National Fire Protection Association.
5. PSIG: Pounds per Square Inch Gauge.
6. PVC: Polyvinyl Chloride Plastic.
7. SDR: Standard Direct Ratio.
8. V: Volt

1.4 PERFORMANCE REQUIREMENTS

A. Location of Sprinklers, Rotors, Emitters and Specialties: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards. Maintain 100 percent, head to head, water coverage of turf and planting areas indicated with uniform coverage and minimum over-spray onto paving and no spray onto buildings and structures.

B. Minimum Working Pressures: The following are minimum rated pressure requirements for piping, valves, and specialties, unless otherwise indicated:

1. Irrigation Main Piping: 200 psig.
2. Lateral (Circuit) Piping: 150 psig.

C. Irrigation Schedule: In accordance with DSA Title 24, Part 1 – Outdoor Water Use Requirements, Contractor shall prepare two (2) – three (3) irrigation schedules, one for plant establishment, one for the established landscape and one for temporarily irrigated areas if applicable. Each schedule shall indicate the number of gallons used and shall target the Estimated Total Water Use (ETWU) and not exceed the Maximum Applied Water Allowance (MAWA) calculated on the Irrigation Plan “California Water Efficient Landscape Worksheet.” Irrigation Schedule shall be submitted at substantial completion. After acceptance of substantial completion, Contractor shall laminate schedule in plastic and place in controller enclosure prior to final completion and end of maintenance. In preparing the Irrigation Schedule, the Contractor shall consider the following:

1. Irrigation interval (days between irrigation).
2. Irrigation run times.
3. Number of cycle starts to avoid runoff.
4. Amount of applied water scheduled to be applied on a monthly basis.
5. Application rate setting.
6. Root depth setting.
7. Plant type setting.
8. Soil type.
9. Slope factor setting.
10. Shade factor setting.
11. Irrigation uniformity or efficiency setting.

1.5 SUBMITTALS

A. Product and Project Data: With-in 14 days after award of the contract, furnish the Owner’s Representative with submittal data on all items intended for installation. Substitute equipment or material installed without the approval of the Owner’s Representative will be removed and replaced with specified items at this Contractor’s expense. Submit manufacturer's technical data and installation instructions for irrigation components conforming to requirements of Submittals, Shop Drawings and Product Data. Include pressure ratings, rated capacities, and settings of irrigation components. Submittal shall include the following:

1. Backflow device including cage and/or blanket.
2. Booster Pump.
3. Main, lateral (circuit) and sleeving pipe.

4. Pipe fittings, primer and cement.
5. Tracer wire and/or warning tape.
6. Isolation valves.
7. Remote control valves.
8. Valve boxes.
9. Sprinklers, rotors, bubblers, drip emitters.
10. Swing joints.
11. Tree bubbler drain tubes.
12. Controllers. Include wiring diagrams, enclosures and mounting methods.
13. Control wires. Include splice kits and conduit.
14. Valve identification tags.
15. Irrigation Wiring Diagram: Contractor shall prepare and submit an irrigation wire diagram showing location of control wire, common wire, spare control wire and spare common wire with quantities noted at each run shown on copy of irrigation plan in a legible size and format.
16. Irrigation installation firm qualifications in accordance with “quality assurance”.
17. Name and contact information of certified irrigation auditor performing the irrigation audit for this project for landscape projects of 2,500 square feet and larger.

B. Coordination Drawings: During the course of construction, maintain orderly set of irrigation drawings and details on project site during installation of irrigation system. Record daily changes showing piping and major system components. Measure and neatly record dimensions for all mainlines, control wire runs, and all other pertinent information facilitating maintenance and extension of the irrigation system to within one (1) foot horizontally and six (6) inches vertically. Indicate interface and spatial relationship between piping, system components, adjacent utilities, and proximate structures. Up to date coordination drawings shall be available for review prior to meetings with the Owner’s Representative.

C. Submittals at Substantial Completion:

1. Irrigation Record Drawings. Contractor shall record information gathered on “Coordination Drawings” onto a clean set of Irrigation Plans for documentation of as-built conditions.
2. Controller Legend: Upon approval of record drawing submittal, prepare two (2) legible, reduced to 11” by 17” in size, non-fading, waterproof copies of the Record Irrigation Drawings, laminated between two (2) .020 mm (minimum) plastic sheets, printed on front side only. Attach one (1) copy to door of controller or enclosure and deliver one (1) copy to Owner. Plan sheet shall include the following information:
    a. Installing Contractor’s company name, phone number and address.
    b. Color coded zone identification by valve.
    c. Zone start time.
    d. Zone water duration.
    e. Type of planting irrigated.

f. Valve size, station numbers and controller designations.

3. For landscapes 2,500 square feet and larger, Contractor shall retain the services of a third party Certified Landscape Irrigation Auditor to perform a landscape irrigation water audit and prepare an irrigation audit report compliant with MWELO 492.12 including, but not limited to inspection, system tune-up, system test with distribution uniformity, correcting over-spray or run-off and configuring controllers with application rate, soil type, plant factors, slope, sun exposure and other factors necessary for accurate programming. Submit preliminary report at substantial completion, allow for adjustments during maintenance and submit report confirming irrigation installation is compliant with DSA MWELO at final completion.

4. Submit Irrigation Schedule for review and approval in accordance with DSA Title 24, Part 1 at substantial completion. Once approved, laminate in plastic and place inside controller enclosure for final completion at end of maintenance period.

5. Contractor shall provide the owner with one (1) quick coupler key with hose swivel per each five (5) quick couplers.

6. Irrigation System Leak Test Results.

7. Irrigation backflow preventer certification.

8. Central control installation certification from a factory authorized representative.

9. Booster pump installation certification from factory-authorized representative.

10. Operation and Maintenance Data: For irrigation systems, to include in emergency, operation, and maintenance manuals. In addition to items specified in "Closeout Procedures," include data for the following:

a. Automatic-control valves.

b. Sprinklers, rotors and/or emitters.

c. Controllers.

1.6 QUALITY ASSURANCE

A. Governing Agency Requirements:

1. For projects subject to review and approval by local governing agencies, Contractor shall comply with the State of California Model Water Efficient Landscape Ordinance at a minimum and shall conform to local codes and/or ordinances, whichever may be more stringent.

2. For projects under review of DSA, Contractor shall comply with the State of California Model Water Efficient Landscape Ordinance requirements at a minimum.

B. Installer Qualifications:

1. Experience: The irrigation installation firm shall have contracted for and successfully completed construction of a minimum of five (5) California public school district construction projects, approved by the Division of the State Architect (DSA), within the past five (5) years of similar size, complexity, budget and scope.

2. Licensure: The irrigation installation firm shall hold a current, active C27 “Landscaping Contractor” license classification by the California State License Board that has been consistently active for at least five (5) years and that has not been suspended or revoked.

3. Supervision: The irrigation installation firm shall have a qualified and experienced irrigation technician on site during irrigation installation.

4. Drip Irrigation: The irrigation installation firm shall have contracted for and successfully complete construction of a minimum of five (5) drip irrigation installations within the past five (5) years of similar size and complexity.

C. Manufacturer Qualifications: Provide underground irrigation system as a complete unit. Each type component produced by a single acceptable manufacturer, including heads, valves, controls and accessories.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Pipe crossings beneath fire Lanes: Comply with NFPA 24-10, Depth of Cover at Fire Access Lanes.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in “Project Management and Coordination”.

G. All work and materials shall be in strict accordance with the latest rules and regulations of the State Fire Marshal, Safety Orders of the Division of Industrial Safety, California Electrical Code, California Administrative Code, part 4, Title 24, “Basic Mechanical Regulations” and other applicable state or local laws or ordinances. Nothing in these drawings or specifications is to be construed as permitting work which does not conform to the codes or regulations.

H. Contractor shall provide all licenses, fees and other charges required for completion of the work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Owner’s Representative no fewer than two days in advance of proposed interruption of water service.

2. Do not proceed with interruption of water service without Owner’s Representative’s written permission.

B. Interruption of Existing Irrigation Service: Do not interrupt existing to remain irrigation service. Prior to demolition work and prior to beginning irrigation work, review project site and meet with Owner Representative to review locations and connections of existing to remain irrigation system. Coordinate with General Contractor to ensure existing irrigation remains in place and

operable through the duration of construction. In the event existing irrigation is shut off or damaged during construction, contractor shall provide temporary connections or modifications to continue water service to existing to remain planting material or turf to maintain in a healthy growing condition throughout construction. In the event water service is not available, contractor shall apply water through manual delivery means as necessary. Obtain approval from Owner's Representation two days in advance of any planned disruptions in water service.

1.9 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.10 MAINTENANCE

A. Irrigation maintenance shall coincide with planting maintenance, refer to Specification 32 90 00 "Planting". In the event planting is not part of this work, maintenance shall begin at written approval from Owner's Representative of substantial completion, run ninety (90) calendar days and until receipt of Owner's Representative's written acceptance of completion of punch list items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Use new materials of brands shown or Drawings, specified herein or approved equal.

B. Use existing materials if shown on Drawings.

C. Substitution of sprinklers, rotors, drip, valves and controllers will not be allowed due to variation in flows, precipitation rates, friction losses, and sizing and maintaining consistency with client equipment standards.

2.2 PIPES, TUBES, AND FITTINGS

A. Above Grade Irrigation Mainline: steel pipe, ASTM A 53/A 53M, Schedule 40, Type S or E, Grade A or B, galvanized with threaded ends.

1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized, seamless steel pipe with threaded ends.

2. Malleable-Iron Unions: ASME B16.39, Class 150, hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface, and female threaded ends.

3. Gray-Iron Threaded Fittings: ASME B16.4, Class 125, galvanized, standard pattern.

4. Cast-Iron Flanges: ASME B16.1, Class 125.

5. Cast-Iron Flanged Fittings: ASME B16.1, Class 125, galvanized.

B. Mainline piping (unless specified otherwise on Drawings):

1. Class 200 (C900), gasketed, purple reclaimed water PVC pipe, ASTM D-2241, NSF approved (size 6" and larger).

2. Class 315 purple reclaimed water PVC pipe, ASTM D-2239, NSF approved (2-1/2" to 4")
3. Schedule 40 purple reclaimed water PVC pipe, ASTM D-1785, NSF approved (2" and smaller).
4. Fittings to be schedule 80 PVC.
5. Six (6) inch and larger pipe to be secured with Lemco stainless steel LB series joint restraints or approved equal.

C. Lateral piping (unless specified otherwise on Drawings):
1. Schedule 40 purple reclaimed water PVC pipe, ASTM D 2466, NSF approved.
2. Fittings to be schedule 40 PVC.

D. Sleeves (unless specified otherwise on Drawings):
1. For irrigation piping, use schedule 40 PVC pipe, NSF approved, two, three (3) inch minimum size for irrigation piping.
2. For irrigation wiring, use schedule 40 PVC pipe, UL listed, NEMA TC-6, ANSI/UL651, ASTM F512, for outdoor, direct bury applications, PVC, two (2) inch minimum size.
3. Fittings to be schedule 40 PVC.

E. SAND BACKFILL: shall consist of natural sand, manufactured sand, existing of native material, or combinations thereof, and shall conform to ASTM c-40 organic impurities, ASTM d-2419 sand equivalent and a pH value between 4.5 and 9.

2.3 VALVES:

A. Backflow Prevention Devise: As indicated on the Drawings installed using above grade steel pipe.

B. Booster pump: As indicated on the Drawings.

C. Quick Coupling Valves: As indicated on the Drawings.

2.4 VALVE BOXES:

A. In paved areas, use Christy concrete utility box, size as required.

B. In planting areas, use Christy plastic underground enclosure. Boxes shall have locking lid, bolt and washer, size as required, color to be green in turf areas and black in planting areas, and purple for recycled water systems.

C. Valve boxes to be round or rectangular and sized as indicated on Drawings.

D. Valve box lids shall be labeled "IRRIGATION".

E. Wire mesh: ½ inch by ½", 16 gauge, galvanized wire mesh hardware cloth.

F. VALVE BOX ROCK: shall be ¾" or smaller drain rock or pea gravel unless specified otherwise on Drawings.

G. VALVE BOX SUPPORT BRICK: shall be common red brick unless specified otherwise on Drawings.

2.5 VALVE IDENTIFICATION TAGS:

A. Shall be plastic yellow in color for potable water systems and purple in color for recycled water systems with 1 1/8" stamped black letters indicating controller/station number.

2.6 PULL BOXES AND SPLICE BOXES:

A. In paved areas, use Christy concrete utility box, size as required.

B. In planting areas, use Christy plastic underground enclosure. Boxes shall have locking lid, bolt and washer, size as required, color to be green in turf areas, black in planting areas, and purple for recycled water systems.

2.7 SPRINKLERS AND/OR TURF ROTORS: As indicated on the drawings.

A. SWING JOINTS: As indicated on the drawings.

B. DRIP SYSTEM: As indicated on the drawings. Drip system fittings shall be of same manufacturer and/or as recommended by manufacturer.

2.8 AUTOMATIC CONTROL SYSTEM:

A. CONTROLLER: As indicated on Drawings.

B. AUTOMATIC CONTROLLER GROUNDING: Contractor shall install grounding recommended by manufacturer for installation method detailed on this project.

C. WIRING: All 24 v line to be #14-1 awg-uf. Control wire insulation to be red in color and spare wire to be yellow in color. 24 v common wire to be #12-1 awg-uf, insulation to be white in color and spare common insulation shall be black in color.

D. SPLICING MATERIALS: manufacturer's packaged kit consisting of insulating, spring-type connector or crimped joint and epoxy resin moisture seal; suitable for direct burial.

E. CONNECTORS: Shall be or 3M "DBY" connectors or equal.

2.9 TRACER WIRE/DETECTABLE WARNING TAPE:

A. Install tracer wire or detectable warning tape as indicated on Drawings.

B. Tracer Wire: #8 solid Bare Copper Wire.

C. Detectable Warning Tape: Electronically detectable plastic tape with metallic core, Terra Tape D, manufactured by Griffolyn Co., or equal, two (2) inches in width, continuously imprinted "caution buried water line".

2.10 CONCRETE THRUST BLOCKING:

A. Shall be clean, Portland cement concrete, cast in place, five sacks of cement per cubic yard mixture with a 28-day compressive strength of 2,500 psi.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 31 "Earthwork" for excavating, trenching, and backfilling.

B. Install piping and wiring in sleeves under sidewalks, roadways, and parking lots, and under or through footings and building walls.

1. Install piping sleeves by boring or jacking under existing paving if possible.
2. Install a minimum of two (2) three (3) inch diameter sleeves in each location for irrigation piping and a minimum of one (1) two (2) inch diameter electrical conduit sleeving in each location for irrigation wire.
3. Sleeves shall extend twelve (12) inches beyond edges of paving and walls with ends capped.

C. Provide minimum cover over top of underground piping according to the following:

1. Irrigation Mainline Piping: Minimum depth of 24 inches below finished grade to top of pipe.
2. Lateral Piping: Minimum depth of 18 inches below finished grade to top of pipe.
3. Sleeves containing control wires, mainline and/or lateral piping beneath standard paving: Minimum depth of 24 inches from finish surface to top of sleeve.
4. Sleeves containing control wires, mainline and/or lateral piping beneath vehicular paving including fire lanes/emergency vehicle access (EVA): Minimum depth of 36 inches from finish surface to top of sleeve.
5. Drip Irrigation: Install drip and/or emitter lines and tubing as detailed on Drawings.

D. Excavate trenches with vertical sides, uniform bottom, free of deleterious materials, and wide enough for pipes to lay side by side, fully supported on bottom. Minimum 3” clearance between pipes. Twelve (12”) inch minimum width for mainlines and six (6”) inch minimum width for lateral lines.

E. Trenches with pressure pipe and control wiring to be backfilled with sand to 6 inches minimum above top of pipe. Continue backfilling in 6 inch layers with soil free of rocks or waste materials. Compact soil to a density equal to the surrounding undisturbed soil, but not less than 90%. Any subsequent depressions shall be filled at the Contractor’s expense. Particular attention is directed to firmly tamp and moistening around sprinkler heads and quick-couplers.

1. For irrigation pipes three (3) inches and larger in size, install additional six (6) inch depth sand beneath piping.

F. Trenches and backfill installed under paving, asphalt concrete or concrete shall be backfilled with sand and compacted in layers equal in density to the adjacent undisturbed soil or to 90% compaction, using manual or mechanical tamping devices. All trenches shall be left flush with the adjoining grade.

1. The Contractor shall set in place, cap and pressure test pressurized mainline under paving prior to the paving installation.

3.2 PREPARATION

A. Set stakes to identify locations of proposed irrigation system. Obtain Owner's Representative's approval before excavation.

3.3 PIPING APPLICATIONS

A. Install components having pressure rating equal to or greater than system operating pressure.

B. Piping in control valve boxes and above ground may be joined with flanges instead of joints indicated.

C. Aboveground Irrigation Main Piping: Use any of the following piping materials for each size range:

1. NPS 4 and Smaller: Steel pipe; malleable-, gray-, or cast-iron fittings; and threaded joints.

2. NPS 5 and Larger: Steel pipe; malleable-, gray-, or cast-iron fittings; and threaded joints.

D. Underground irrigation main piping shall be purple recycled water pipe, polyvinyl chloride (Type I) plastic pipe PVC 1120 and NSF approved, Schedule 40 PVC solvent-weld.

E. Underground Irrigation Lateral (Circuit) piping shall be purple recycled water pipe, polyvinyl chloride (Type I) plastic pipe PVC 1120 and NSF approved, schedule 40 PVC solvent-weld.

F. Mainline pipe sizes 6" and larger shall use gasketed pipe with bell fittings. Where solvent weld joints are required, contractor shall additionally install concrete thrust blocking.

G. Underground Branches and Offsets at Sprinklers and Devices: Schedule 80, PVC pipe; threaded PVC fittings; and threaded joints.

H. Mainline Fittings and Couplings: Schedule 80, PVC pipe, solvent weld up to 4" and gasketed with bell fittings 6" and larger pipe.

I. Risers to Aboveground Sprinklers and Specialties: ASTM A-120 Schedule 40 galvanized steel pipe with 150 lb. banded galvanized malleable iron fittings.

J. Double Swing Joint Assembly (unless specified otherwise on Drawings):

1. Install per manufacturers recommendations.

2. Install double swing joint at all sprinkler heads and quick couplers.

3. Elbows shall be PVC Class 1220, Schedule 40.

4. Install as follows:

a. Screw 2 inch long nipple horizontally into plastic tee or ell at lateral line.

b. Screw on elbow and a 6 inch long nipple.

c. Screw on another elbow and a 2 inch long nipple and install riser vertically to head, or quick coupler valve.

d. Swing joint must offset to the right.

K. Sleeves: Schedule 40 PVC pipe and socket fittings; and solvent-cemented joints.

L. Transition Fittings: Use transition fittings for plastic-to-metal pipe connections according to the following:

1. Couplings:

a. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.

b. Underground Piping NPS 2 and Larger: AWWA transition coupling.

2. Fittings:

a. Aboveground Piping: Plastic-to-metal transition fittings.

b. Underground Piping: Union with plastic end of same material as plastic piping.

M. Dielectric Fittings: Use dielectric fittings for dissimilar-metal pipe connections according to the following:

1. Underground Piping:

a. NPS 2 and Smaller: Dielectric couplings or dielectric nipples.

b. NPS 2-1/2 and Larger: Prohibited except in valve box.

2. Above ground Piping:

a. NPS 2 and Smaller: Dielectric unions.

b. NPS 2-1/2 to NPS 4: Dielectric flanges.

3. Piping in Valve Boxes or Vaults:

a. NPS 2 and Smaller: Dielectric unions.

b. NPS 2-1/2 to NPS 4: Dielectric flanges.

4. Dielectric fittings are specified in Division 22 Plumbing.

3.4 VALVE APPLICATIONS

A. Backflow Prevention Devices:

1. New and relocated backflow devices must be tested at time of installation. Contractor shall have test performed by a Certified Backflow Tester who has a current State of California Contractor's license C-36 or General Contracting License.

2. For new backflow preventer installation, a Certified Tester shall test and provide results and certification to the Owner's Representative within five (5) days of the date of testing and to provide any testing data or certification required by the local water provider. A Department of Public Health sticker shall be place on backflow device before the system is accepted by the Owner's Representative.

3. Install per local codes and water purveyor requirements.

4. A Department of Public Health sticker shall be placed on backflow device before the system is accepted by the Owner's Representative.

B. Underground Gate/Ball Valves: Install in control-valve box as detailed on drawings.

C. Underground, Manual Control Valves: Install in manual control-valve box as detailed on drawings.

D. Remote Control Valves: Install in control-valve box as detailed on drawings.

E. Drain Valves: Install in control-valve box as detailed on drawings.

F. Install each valve in a separate valve box (unless noted otherwise in Drawings and details) and in appropriate locations as shown on Drawings. Allow 12 inches between valve boxes and between valve boxes and walls or walks or landscape edges. Boxes shall be arranged perpendicular and parallel to each other and aligned in a row.

3.5 PIPING INSTALLATION

A. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings. Piping shown on drawings is diagrammatic. General arrangement of piping shall be followed as near as practical. Where piping is shown running continuously in paving and adjacent to planting area, intent is to install piping within planting areas where practical.

B. Install pipe sleeves at all points where pipes pass through concrete, asphalt or masonry. In footings, allow 1 inch clearance around pipe, and in other locations allow ½ inch. Each end of sleeve shall extend 6 inches beyond edge of paving or structure above. Provide removable non-decaying plug at each end of sleeve to prevent intrusion of earth and debris.

C. If drain valves are used, install piping at minimum uniform slope of 0.5 percent down toward drain valves.

D. Install piping free of sags and vertical bends.

E. Install groups of pipes parallel to each other, spaced to permit valve servicing.

F. Install fittings for changes in direction and branch connections. Pipe bending shall not exceed manufacturer recommended radii.

G. Install flanges adjacent to valves and to final connections to other components with NPS 2-1/2 or larger pipe connection.

H. Install dielectric fittings to connect piping of dissimilar metals.

I. Install underground thermoplastic piping according to ASTM D 2774 and ASTM F 690.

J. Lay piping on solid sub-base, fully and evenly supported by bedding, uniformly sloped without humps or depressions.

K. Install PVC piping in dry weather when temperature is above 40 degrees F (5 degrees C). Allow joints to cure at least 24 hours at temperatures above 40 degrees F (5 degrees C) before testing unless otherwise recommended by manufacturer.

L. Snake pipe a minimum of one (1) additional foot per one hundred (100) feet of pipe to allow for expansion and contraction.

M. Cap or plug openings as soon as lines have been installed to prevent intrusion of debris.

N. Thrust Blocking: Install concrete thrust blocking, at a minimum, on pressurized mainline three (3) inches and four (4) inches in size at changes in direction, connections or branches from mainline and dead ends and as necessary to prevent pipe movement thrusts created by internal water pressure. Concrete shall be placed directly on the fitting perpendicular to the line of thrust and also against the undisturbed earth. The amount of concrete shall be in accordance to the pressure, angle and soil type. Refer to pipe manufacturer for calculating exact size of thrust blocking material, 2022 CPC and IAPMO installation standards.

O. Joint Restraints: Install joint restraints per manufacturer recommendations on pressurized mainlines six (6) inches and larger at changes in direction, connections or branches from mainline and dead ends and as necessary to prevent pipe movement thrusts created by internal water pressure.

P. After installation of pipe lines and sprinkler risers, and prior to installation of sprinkler heads, automatic valves and quick couplers, thoroughly flush all lines with a full head of water to remove any foreign material, scale, sediment, etc.

3.6 TRACER WIRE

A. Install as detailed along all new irrigation mainline piping on bottom of trench, carefully run to avoid stress from backfilling and shall be continuous throughout the mainline pipe runs. Fasten tracer wire to mainline at eight (8) foot intervals with tape. Take precautions to ensure tape is not damaged or misplaced during backfill operations.

B. Tracer wire shall follow mainline pipe and branch lines, originating in irrigation valve box at gate, ball or remote control valve located closest to irrigation point of connection and run to ball, gate and/or remote control valves at the end of mainline runs or shall loop entire system where mainlines are looped.

C. Record locations of tracer wire origin and terminations on project record drawings.

3.7 DETECTABLE WARNING TAPE

A. Install tape with printed side up, directly over mainline pipe and on top of sand backfill, 18 inches below grade. Take precautions to ensure tape is not damaged or misplaced during backfill operations.

3.8 JOINT CONSTRUCTION

A. Refer to Division 22 for plumbing Basic Materials and Methods for basic pipe joint construction.

B. Install threaded pipe joints as follows:

1. Use pipe joint sealant for all plastic to plastic and plastic to steel joints, do not apply to sprinkler inlet ports.

2. For PVC, hand tighten only. Do not over tighten threaded joints. Thread until fitting stops, then add a half turn.

3. Use pipe joint compound and/or Teflon tape for all steel to steel joints.

C. Install gasketed joint per manufacturer recommendations (printed on pipe material) and using the lubricant supplied with the pipe.

3.9 SPRINKLER INSTALLATION

A. Locate part-circle sprinklers to maintain a minimum distance of six (6) inches from adjacent paving and edges and twelve (12) inches clearance from walls, fences and other structures, unless otherwise indicated on Drawings.

B. Spray sprinklers shall not be installed less than 24” from non-permeable surfaces unless the adjacent non-permeable surface is constructed to drain entirely to the landscape area.

C. Swing Joint Assembly:

1. Install triple swing joint at all sprinkler heads and quick couplers.
2. Elbows shall be PVC Class 1220, Schedule 40.
3. Install as follows:
    a. Screw 2 inch long nipple horizontally into plastic tee or ell at lateral line.
    b. Screw on elbow and a 6 inch long nipple.
    c. Screw on another elbow and a 2 inch long nipple.
    d. Screw on another elbow and install riser vertically to head, or quick coupler valve.
    e. Swing joint must offset to the right.

D. Sprinkler Installation:

1. Install sprinklers heads as shown on drawings and details.
2. Install plumb to finish grade.
3. Tool tighten all sprinkler body covers and nozzles.

3.10 DRIP/EMITTER INSTALLATION

A. Minimum cover sub-surface drip tubing: Drip and/or emitter lines shall be installed as detailed on Drawings and below the mulch top dressing layer.

B. Minimum cover of tubing to individual shrubs: Shrub bubbler tubing shall be installed to a depth of (4) inches and rising to the surface at target shrub rootball. No more than one (1) inch of tubing shall be exposed at shrub rootball.

C. Backfill after lines have been reviewed, tested for leaks and approved by Owner’s Representative.

D. Assembling drip system shall keep pipe and tubing free from dirt and debris, pipe ends shall be cut square, deburred and cleaned.

E. Flush piping prior to installing remote control valve assembly (control zone kit assembly).

F. Follow manufacturer recommendations.

3.11 AUTOMATIC-CONTROL SYSTEM INSTALLATION:

A. Exact location of controllers shall be reviewed and approved by Owner's Representative.

B. Provide connection to nearest available 110 volt electrical service.

C. Prior to installation of hardscape, coordinate and install electrical supply and control wire conduit, size and quantity as required for each controller and spare wiring. Install pull boxes and conduit from clock location.

D. Contractor shall install grounding system per manufacturer recommendations.

E. Control wiring shall be neatly coiled beneath controller terminal strip and labeled with corresponding station number. Controller terminal strip cover plate shall fasten securely in place.

F. Contractor is responsible to provide fully automatic system operated by specified controller(s). Contractor shall install quantity of red wiring equal to the number of stations on the specified irrigation controller(s), plus five (5) yellow spare control wires for each controller, a common white wire and a spare common black wire. Example, 24 station clock shall have 24 control wires, 5 spare control wires and 2 common wires installed with mainline and running through all associated valve boxes. Wires shall be installed per plans and details from remote control valve(s) to controller(s).

G. Example of mainline that is not looped and terminates in 3 locations with a 24 station clock and 18 stations used:

1. Wire quantities shall be:
   a. 18 red control wires for stations 1-18
   b. 6 red control wires for un-used stations 19-24
   c. 1 white common wire
   d. 1 black spare common wire
   e. 5 yellow spare wires

2. Wire runs:
   a. 18 red control wires (stations 1-18) shall run from controller to corresponding valve.
   b. 6 red control wires (un-used stations 19-24) shall run from controller and loop through each valve box associated with that controller.
   c. 1 white common wire shall run from controller and connect to each valve associated with that controller.
   d. 1 black spare common wire shall run from controller and connect to each valve associated with that controller.
   e. 5 yellow spare control wires shall run from controller and loop through each valve box associated with that controller.

3. Contractor shall label all wires with water-proof marking with corresponding station number or as spare control wire, spare common wire or spare stations 19-24.

H. Wiring path is not shown on drawings and shall run from specified controller(s) to irrigation pull box if shown, then to the nearest irrigation mainline location, follow mainline (existing and/or new) to each remote control valve. Indicate wire location on record drawings where it does not follow mainline. Common and spare wires shall loop through entire system. Wiring may be shown on drawings only where required for future irrigation extensions.

I. Wiring may be shown on drawings only where required for future irrigation extensions.

J. Irrigation Central Control system is standard for this project.

K. Irrigation Central Control System must be compatible with owners central control software and hardware. Contractor shall ensure controller communicates properly with project central computer and receives daily downloads for weather updates.

3.12 CONNECTIONS/ELECTRICAL WIRING

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Ground equipment according to Division 26 Section.

C. Connect wiring according to Division 26 Section.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

E. 24 volt splices to be made with 3M Co. #3577 splice kit, as to manufacturer’s instructions. Splices to be made only at valve box or pull box.

3.13 REMOTE CONTROL VALVE WIRING

A. Wires shall be installed in gray UL approved electrical conduit between controller and pull box. Pull box to be located in ground nearest controller. Top of box to be flush with finish grade.

B. Provide separate irrigation wire sleeves under concrete or asphalt for irrigation wires, size and quantity as required, three (3) inches minimum in diameter, 24” minimum cover in planting areas and 36” minimum cover under fire lanes and pavements.

C. Wires from the pull box to remote control valves shall be direct burial. The wiring shall be bundled and secured to the lower side of the irrigation pipe at ten (10) foot intervals with plastic electrical tape. Sufficient slack shall be left in the wire to provide for expansion and contraction.

D. Provide 24 inches excess of coil of control wires in each 100 feet of run to controller.

E. Provide 24 inches excess of coil of control wires in each valve box and pull box.

F. Control wires to be buried a minimum of 24 inches below finish grade.

G. Wiring shall be tested for continuity, open circuits and unintentional grounds prior to connecting to equipment.

H. Install irrigation wire splice boxes where wire splices are necessary.

3.14 LABELING AND IDENTIFYING

A. Valve Identification Tags: Install valve identification tag on each remote control valve with corresponding controller station number.

3.15 FIELD QUALITY CONTROL

A. Manufacturer's Field Service for irrigation pumps and central control systems: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including mounting, electrical connections, water connections, grounding and proper communication on site, with hand-held remotes and with central computer software. Make repairs and/or adjustments as recommended. Submit factory-authorized service representative's written approval of installation at Substantial Completion.

B. After substantial completion, for landscapes 2,500 square feet and larger, Contractor shall schedule an Irrigation Audit to be performed by a third-party certified landscape irrigation auditor. Contractor shall make necessary adjustments, if any, during maintenance period and provide written certification of installation from certified landscape irrigation auditor as part of final completion and end of maintenance.

C. Perform the following field tests and inspections in the presence of the Inspector and/or Owner's Representative with 72 hours advance notice. Contractor shall record date, time, names of those present and results and submit to Owner's Representative prior to requesting substantial completion review:

1. Leak test of pressurized mainline: After installation of mainline and prior to installing remote control valves, quick coupling valves or other valve assemblies and prior to backfilling trenches, test the mainline for leaks as follows:

    a. Testing shall occur with trenches open. Center load piping with small amounts of backfill between fittings to prevent pipe displacement, arching or slipping. Fittings to be visible for testing.

    b. Exercise care in filling the system with water to prevent excessive surge pressure and water hammer

    c. Test pressurized mainline piping under hydrostatic pressure of 125 psi for eight (8) continuous hours, minimum. Coordinate with Owner's Representative for initial observation of beginning test and observation after test. Install two (2) pressure gauges at opposite ends of mainline system. Pressurize system up to a minimum of 125 psi the day preceding the scheduled test and verify the pressure is holding at both ends. Inspect system early the following day in the presence of the Owner's Representative and note pressure. One hour later, verify pressure has not dropped more than five (5) psi in the presence of the Owner's Representative.

    d. Correct deficiencies revealed by test and repeat pressure test to the satisfaction of the Owner's Representative.

2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.

3. Coverage Test: When the irrigation system has been completed, the Contractor, in the presence of the Architect and Owner's Representative, shall perform a Coverage Test to determine if the coverage of water is complete and adequate, the sprinkler heads and/or emitters function according to manufacturers' data and according to the intent of the construction documents. Replace irrigation components not performing satisfactorily and/or respace sprinklers and/or nozzles and/or emitters as necessary to provide complete irrigation coverage of plant material.

    a. For new turf areas, Contractor shall demonstrate irrigation coverage over amended soil and prior to installation of sod and/or seeded turf.

4. Substantial Completion Review: At substantial completion of this Section, work shall be reviewed for conformance with the Drawings and Contractor shall make

recommended repairs and/or corrections in a timely manner and prior to final completion.

a. At substantial completion, contractor shall submit Certified Landscape Irrigation Auditor preliminary report on irrigation system for landscapes 2,500 square feet and larger.

b. At substantial completion, Contractor shall submit documentation per 1.5 “submittals at substantial completion” to Architect for review and acceptance.

c. At substantial completion, Contractor shall deliver spare parts to District Representative per 1.5 “Submittals at substantial completion”.

5. Final Completion Review: After substantial completion repairs and/or corrections have been completed and at the end of the maintenance period, work shall be reviewed for final completion and approved by Owner’s Representative in writing.

a. At final completion, for landscapes 2,500 and larger, Contractor shall submit Certified Landscape Irrigation Auditor final report confirming irrigation installation is compliant with DSA MWELO requirements.

3.16 CLOSING IN UN-INSPECTED WORK

A. The Contractor will pay all costs necessitated by required opening, restoration and correction of all work closed in or concealed before inspection, testing as required, and approval by authorized inspections.

3.17 STARTUP SERVICE

A. Verify that controllers are installed and connected according to the Contract Documents.

B. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 16 Sections.

C. Complete startup checks according to manufacturer's written instructions.

3.18 MAINTENANCE SCHEDULE

A. Fine tune and adjust irrigation system weekly coinciding with the landscape and/or turf planting maintenance period.

B. Adjust settings of controllers within WELO water budget and with seasonal changes.

C. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.

D. Adjust sprinklers so they will be flush with, or not more than 1/2 inch above, finish grade.

E. Fill irrigation trenches due to settling.

3.19 CLEANING

A. Completely flush dirt and debris from piping before installing sprinklers and other devices.

B. After completion, cleanup and remove all resultant debris from site.

3.20 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain controller and automatic control valves. Refer to “Demonstration and Training."

3.21 GUARANTEE (Project Close-out Item)

A. Furnish a written Guarantee to the Owner, dated from the date of Final Acceptance, against defective workmanship, materials or components and guaranteeing repair or replacement for a period of 1 year; further guarantee restoration of all damage caused by leaks in the Irrigation System for a like period.

B. Guarantee that the entire installation was made in accordance with the drawings, specifications and manufacturer’s recommendations, using designated materials and installation procedures.

C. Submit duplicate copies of the Guarantee for approval by the Owner’s Representative. Approval is mandatory before final payment and acceptance.

D. The guarantee for the irrigation system shall be made in accordance with the form attached at the end of this Section. The guarantee form shall be retyped onto the Contractors letterhead and contain the information shown.

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse or neglect excepted.

We agree to repair or replace any defects in materials and workmanship which may develop during the period for one (1) year from the date of acceptance and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice.

The Owner reserves the right to make temporary repairs as necessary to keep the irrigation system and equipment in operating conditions. This shall not relieve the Contractor of his responsibilities under this Guarantee.

In the event of failure to make such repairs or replacements within a reasonable time after receipt of written notice form the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

Project:_____

Location:_____

_____

Name of Contractor:_____

Signed: (Authorized Signature)_____

Print Name of Authorized Signature_____

Address:_____

_____

Phone:_____ Date of Acceptance:_____

END OF SECTION

SECTION 32 90 00 - Planting

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Trees.
2. Shrubs.
3. Ground cover.
4. Vines.
5. Edgings.
6. Planters.
7. Bio-retention Basin.

B. Related Sections include the following:

1. Specification Section 32 91 00 “Temporary Tree and Plant Protection”.
2. Specification Section 31 05 13 “Earthwork” for excavation, filling and rough grading and for subsurface aggregate drainage and drainage backfill materials.
3. Specification Section 32 84 00 “Planting Irrigation”.

1.3 DEFINITIONS

A. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Import Topsoil: Shall be obtained from a local source and coming from a site with similar soil characteristics as the project site. Topsoil shall be fertile, friable, natural loam surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter and free of roots, stumps, stones and rocks and other extraneous or toxic matter harmful to plant growth.

D. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

E. On-site Topsoil: Naturally occurring, on-site, surface soil, usually occurring in the top four (4) to twelve (12) inches of original, undisturbed surface soil containing organic material, micro-

organisms, necessary nutrients and minerals to sustain plant growth and be approved to sustain plant life by an approved soil analysis laboratory.

F. Planting Soil: On-site topsoil, import topsoil or manufactured topsoil.

G. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

H. Plant material: Exterior plants contained within the planting plan legend in categories of Trees, Shrubs, Vines, Perennials, Annuals and/or Ground Covers.

I. Substantial completion for landscape and irrigation: Work shall be considered substantially complete when irrigation, planting, turf planting and seeding are installed correctly per plans and specifications with only minor adjustments required and approval has been submitted in writing by Owner's Representative.

J. Final completion for landscape and irrigation: Work shall be considered complete when irrigation, planting, turf planting and seeding are installed correctly per plans and specifications and the maintenance period has been completed per plans and specifications and approval has been submitted in writing by Owner's Representative.

1.4 SUBMITTALS

A. Product, Material Data and/or Samples: For each type of product specified. Submit manufacturer’s technical data and installation instructions for landscape products conforming to requirements of Submittals, Shop Drawings and Product Data to include, but not be limited to:

1. Samples for the following:
    a. Organic mulch top dressing (1/2 c.f. each)
    b. Edging materials and accessories, of manufacturer's standard size, to verify color selected.
2. Manufacturer's certified analysis for standard products.
3. Material Test Reports: For on-site topsoil, import topsoil and/or manufactured soil proposed for use on this project.
4. Planting soil amendments as recommended by soil analysis laboratory.
5. Qualification Data: For landscape Installer in compliance with “Quality Assurance”.

B. Plant Materials List: Submit confirmation from supplier 30 days prior to planting that all plant material has been ordered.

C. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer shall be delivered to Owner’s Representative upon delivery.

D. Qualification Data: For landscape Installer prior to performing work.

E. Planting Schedule: Indicating anticipated planting dates for each type of planting.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Experience: The landscape installation firm shall have contracted for and successfully completed construction of a minimum of five (5) California public school district construction projects, approved by the Division of the State Architect (DSA), within the past five (5) years of similar size, complexity, budget and scope.

2. Licensure: The landscape installation firm shall hold a current, active C27 “Landscaping Contractor” license classification by the California State License Board that has been consistently active for at least five (5) years and that has not been suspended or revoked.

3. Supervision: The landscape installation firm shall have a qualified and experienced landscape technician on site during landscape installation.

B. Soil Analysis Laboratory Qualifications: Testing laboratory shall be Lucchesi Plant and Soil Consulting, LLC., www.lucchesiconsulting.com,(408) 337-2575, or approved equal independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Soil Analysis: Furnish soil analysis by a qualified soil analysis laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity (CEC) or total exchangeable cations (TEC); sodium absorption ratio; deleterious material; pH; soluble salts, boron, mineral and plant-nutrient content of planting soil.

1. Report suitability of planting soil for plant growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory planting soil.

D. Protect existing to remain and newly installed lawn and/or landscape areas from damage or trespass by maintaining construction fencing during construction and maintenance.

E. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."

1. Selection of exterior plants purchased under allowances will be made by Owner’s Representative, who will tag plants at their place of growth before they are prepared for transplanting.

F. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above ground for trees up to 4-inch caliper size, and 12 inches above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

G. Observation: Owner’s Representative may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Owner’s Representative retains right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Owner's Representative of sources of planting materials 30 days in advance of delivery to site.
2. Prior to Owner's Representative review of plant material, trees shall be neatly spaced approximately 5' apart (minimum) to allow for access in and around each tree and far enough to visually review each tree canopy without obstruction from other tree and/or shrub canopies.

H. Pre-installation Conference: Conduct conference at Project site with General Contractor and/or Owner's Representative to comply with requirements "Project Management and Coordination."

I. Protect all planting areas from trespass or damage by installing temporary barriers or protective fencing during construction. Barrier and/or fencing material and installation method shall be approved by Owner's Representative prior to installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Notify Owner's Representative fourteen (14) days prior to anticipated plant material delivery to schedule review of plant material prior to installation.

B. Do not prune trees and shrubs before delivery, except as approved by Owner's Representative. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.

C. Handle planting stock by root ball.

D. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist.

1. Do not remove container-grown stock from containers before time of planting.
2. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.7 PROJECT/SITE CONDITIONS

A. Prior to placing topsoil, Contractor shall collect and submit soil samples representative of on-site topsoil and/or import topsoil proposed for use in all planting and lawn areas to a soil analysis laboratory for analysis and soil amending recommendations. Submit test results analysis and recommendations to Owner's Representative for review and approval prior to beginning work.

B. Weather Limitations: Proceed with planting only when weather conditions permit.

C. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns, unless otherwise acceptable to Owner's Representative.

1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

D. Irrigation system shall be installed and operative before beginning planting operation.

E. Contractor shall protect new plantings and/or delay planting in event of forecasted freezing temperatures.

1.8 WARRANTY

A. Special Warranty: Warrant the following exterior plants, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner or users, or incidents that are beyond Contractor's control.

1. Warranty Period for Trees, Shrubs, Vines, Lawns and Ground Covers: One year from date of Final Completion.

2. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.

3. Replace exterior plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.

4. A limit of one replacement of each exterior plant will be required, except for losses or replacements due to failure to comply with requirements.

1.9 MAINTENANCE

A. Plant Material and Planting Areas: Maintain for the following maintenance period by pruning, cultivating, watering, weeding, fertilizing, restoring planting basins, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Refer to “Maintenance Schedule.”

1. Maintenance Period: Ninety (90) days from date of Owners Representative’s written approval of Substantial Completion of the planting and irrigation.

2. In the event plant material fails during the maintenance period due to Contractor negligence, the maintenance period shall extend until 90% of the plant material is established as determined by the Owner’s Representative.

PART 2 - PRODUCTS

2.1 TREE, SHRUB AND VINE MATERIAL

A. General: Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

B. Grade: Provide trees and shrubs of sizes and grades complying with ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Owner’s Representative, with a proportionate increase in size of roots or balls.

C. Label at least one tree and one shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.

D. If formal arrangements or consecutive order of trees or shrubs is shown, select stock for uniform height and spread, and number label to assure symmetry in planting.

E. Provide plant material as specified on the Drawings including size, genus, species and variety.

2.2 SINGLE-TRUNK AND MULTI-TRUNK TREES

A. Trees: Single-trunk or multi-trunk trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.

1. Branching Height: typical of tree species and container size, single trunk unless specified as multi-trunk on Planting Plan Legend. Select branching height in accordance with planting location. Low branching trees shall not be planted in conflict with pathways, driveways and/or structures.

2. Single-stem trees shall have straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.

3. Multi-stem trees shall branch naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1.

2.3 GROUND COVER PLANTS

A. Ground Cover: Provide ground cover of species indicated, established and well rooted in pots or similar containers, and complying with ANSI Z60.1.

2.4 PLANTS

A. Annuals: Provide healthy, disease-free plants of species and variety shown or listed. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud and bloom.

B. Perennials: Provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed, remove dead flowers.

2.5 TOPSOIL

A. Prior to placing bid, Contractor to coordinate with General Contractor, Demolition and/or Grading Contractors and verify quantity and source of planting soil for all planting areas. Identify Contractor responsible for stockpiling on-site topsoil and/or acquiring import planting soil and installing a minimum of twelve (12) inches of planting soil in all landscape planting areas and any raised planters and rough grading in accordance with these specifications, details, notes, grading and drainage plans.

B. Coordinate with General Contractor, Demolition and/or Grading Contractors for removal and replacement of lime treated soils and replacement with planting soil prior to planting to depth required to remove lime treatment. In event trees are planted in lime treated soils, trees shall have a minimum six (6) inch layer of planting soil below their rootball to provide a suitable substrate to root into for establishment.

C. On-site topsoil: Re-use existing topsoil or existing surface soil, top twelve (12) inches excavated and stockpiled on-site. Verify suitability of existing and/or stockpiled surface soil to produce planting soil by submitting a sample to a soil analysis laboratory. Acceptable on-site topsoil shall be ASTM D 5268, pH range of 5.5 to 7.5 (5.8 to 7.8 for predominantly California native plant species), representative of productive soils in the vicinity, a range of 4 to 15 percent organic material content; free of stones one (1) inch or larger in any dimension, roots, plants, sod, clay lumps and other extraneous materials harmful to plant growth. Sodium absorption rate (SAR) shall not exceed 5.0, conductivity of the saturation extract solution shall not exceed 3.0, and boron concentration in the saturation shall not exceed 1.0 ppm. Fine gravel (2-5 mm) and coarse gravel (5-12 mm) content shall not exceed 30%.

D. Import Topsoil: Supplement with imported or manufactured topsoil from off-site, local sources, when quantities of on-site topsoil are insufficient. Do not obtain topsoil from bogs or marshes. If soil is obtained from agricultural land, Contractor shall submit proof soil is nematode free. Import topsoil shall meet the following requirements:

1. USDA Classification of fraction passing 2.0 mm sieve: sandy loam, sandy clay loam or loam.

2.

Class	Particle size range	maximum, %	minimum, %
Coarse Sand	0.5 – 2.0 mm	15	0
Silt	.002-.05 mm	30	10
Clay	<.002 mm	25	10
Other Classes			
Gravel	2-13 mm	15	0
Rock	½-1 inch	5% by volume with	none >1 inch
Organic		15	4

3. Chemistry – Suitability Considerations
   Salinity: Saturation Extract Conductivity (ECe)
   Less than 3.0 dS/m @ 25 degrees C.
   Sodium: Sodium Adsorption Ratio (SAR)
   Less than 6 ppm
   Boron: Saturation Extract Concentration
   Less than 1.00 ppm
   Reaction: pH of Saturated Paste: 5.5 – 7.5 without high lime content.

4. Soil to contain sufficient quantities of available nitrogen, phosphorus, potassium, calcium and magnesium to support normal plant growth. In the event of nutrient inadequacies, provisions shall be made to add required materials prior to planting.

5. Soil Analysis: Contractor shall submit to the Owner's representative for approval, certification from an agricultural soils analysis laboratory that the import topsoil provided conforms to the specifications prior to delivery of import or placement on on-site topsoil. Soil analysis shall have been performed on import topsoil source within the previous year.

2.6 BIO-RETENTION BASIN

A. Refer to civil drawings for construction of bio-retention basin swales.

B. Line bio-retention basin swale with Lenox Blend soil mixture available from LH Voss Materials, Inc. 2445 Del Vista Monte, Concord, CA 94520, www.lhvoss.com, (800) 660-8677. Depth shall be a minimum of 18" unless specified otherwise within plans and/or details.

2.7 FERTILIZER AND SOIL AMENDMENTS

A. Contractor shall collect and submit sample of proposed planting soil, representative of the top eight (8) inches of planting soil, to a locally known soil analysis laboratory, soil analysis laboratory for analysis and amendment recommendations. Sample shall be representative of typical on-site topsoil proposed for use in planting areas.

B. If import topsoil is proposed, import topsoil sample shall be submitted to a soil analysis laboratory locally known for analysis, amendment recommendations and installation recommendations.

C. Contractor shall provide soil analysis laboratory, the following information when submitting soil for analysis:

1. Project type (public school, commercial building, etc.).
2. Anticipated maintenance (regular, low, none, etc.).
3. Irrigation water source (potable or recycled).
4. Proposed plant material type such as California native plants, turf, shrub and ground covers.
5. Copy of this specification.

D. Fertilizers: All fertilizers shall be of an approved brand with a guaranteed chemical analysis as required by USDA regulations and shall be dry and (except for plant tabs) free flowing.

E. Nitrogen Stabilized Organic Amendment: 0-1/4 inch nitrogen-stabilized organic amendment contributing at least 270 pounds of organic matter per cubic yard. Consider using Composted Greenwaste Organic Soil Amendment, such as Z-Best Organic Compost from Zanker Landscape Materials (www.zankerlandscapematerials.com) or equal, if recommended by soil analysis laboratory. Compost shall be obtained from a supplier participating in the Seal of Testing Assurance (STA) program of the U.S. Composting Council.

1. In order to comply with MWELO 492.6, 3. (C). Soil Preparation, Mulch and Amendments, at a minimum, compost shall be applied at a rate of four (4) cubic yards per 1,000 square feet of permeable area incorporated to a depth of six (6) inches into the soil. Soils with greater than 6% of organic matter in the top six (6) inches are exempt from adding compost.
2. Nitrogen stabilized sawdust shall not be used.

F. Soil Preparation: The following materials and quantities are given for bidding purposes only and Contractor shall amend soil using products, quantities and methods specified by soil analysis laboratory.

1. Nitrogen stabilized organic amendment.
2. All-purpose granular fertilizer (6-20-20).
3. Soil sulfur.

G. Planting Tablets: 21 gram controlled release fertilizer supplying nitrogen for up to 1 ½ years and 20-10-5 content.

H. Backfill Mix: Shall be a mixture of on-site or import topsoil, nitrogen stabilized organic amendment and fertilizer. For bidding purposes, backfill mix shall include 2/3 topsoil and 1/3 nitrogen stabilized organic amendment with 6-20-20 granular fertilizer, quantity per manufacturer, according to container or root stock size, mixed thoroughly.

2.8 MULCHES

A. Due to variation in mulch sizes, Contractor shall remove large bark mulch in excess of approximately ¾” x ½” x 6” in size of 2.5 cubic inches in volume.

B. Organic Mulch for non-bio-retention planting areas: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of organic bark from Republic

Services, Pro-Chip decorative mulch, Republic Services, Newby Island Recyclery, Milpitas, CA (408) 945-2836. Color to be mahogany. Submit sample to Owners Representative's for review and approval.

C. Organic Mulch for Bio-retention basin swales: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of organic shredded cedar bark from Pacific Landscape Supply (209) 593-1199, www.pacificlandscapesupply.com, or equal. Submit sample to Owners Representative's for review and approval.

2.9 HERBICIDES

A. Pre-emergent: Ronstar-G, or approved equal.

B. Selective and non-selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

C. Contact Owner and obtain School District, Local, State and Federal policies and procedures for regulating application of chemical controls. Contractor shall comply with all applicable policies and/or procedures for application, posting and notifications.

2.10 STAKES AND GUYS

A. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, redwood, or pressure-preservative-treated Douglas Fir or Lodgepole Pine, free of knots, holes, cross grain, and other defects, two (2) inches in diameter by length required, and pointed at one end.

B. Guy and Tie Wire: ASTM A 641/A 641M, Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch in diameter.

C. Guy Cable: 5-strand, 3/16-inch- diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.

D. Tree Ties: Z-Strap tree ties, or equal, made of one (1) inch wide by on-quarter (1/4) inch thick, black recycled tire rubber with pre-punched nail holes. Contact Sullivan & Mann Lumber Company, Inc. (888) 899-3400 (www.sullivanandmann.com).

E. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

2.11 LANDSCAPE EDGINGS/HEADERBOARD

A. Wood Strip Edging, unless indicated otherwise on Drawings, shall be as follows:

1. Species: Construction Heart Redwood, size per detail.
2. Stakes: Construction heart redwood, size per detail, with galvanized nails for anchoring edging.
3. Splice Plate: Same species as edging, 1 by 6 by 24 inches long in nominal size, with galvanized nails for securing in place.

2.12 WATER

A. Water shall be suitable for irrigation and free from ingredients harmful to planting areas.

2.13 POTTING SOIL

A. Potting soil shall be Supersoil® or equal potting soil, blend of organic materials, natural and traditional fertilizers, formulated for outdoor container plants with no fertilizing required for up to ninety (90) days after planting.

2.14 MISCELLANEOUS PRODUCTS

A. Tree Trunk Guard: nine (9) inch high by four (4) inch diameter plastic, corrugated tube, Arbor Guard + or equal.

B. Tree Root Barriers: 18” high by 24” wide, interlocking panels of not less than 0.080” (2.032 mm) thickness, black in color, at least 50% recycled material, injection molded plastic product for linear applications with ultra-violet inhibitors with anti-lift ground lock tabs, vertical root deflecting ribs and double top edge consisting of two parallel, horizontal ribs on the top.

C. Jute Netting: Biodegradable in two (2) to three (3) years from installation, absorbing water four to five times fabric weight, open area 60% to 65%, available in rolls four (4) feet in width. Use galvanized steel staples as recommended by manufacturer to secure netting in place.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Planting operations shall be performed when weather and soil conditions are suitable for planting.

3.2 PREPARATION

A. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

B. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.

C. Install protective barriers and/or fencing as necessary.

D. Contact and obtain Owner’s Representative, Local, State and Federal policies and procedures for regulating application of fertilizers, fungicides, insecticides, pesticides and herbicides. Contractor shall comply with all applicable policies and/or procedures for application, posting and notifications.

E. Do not excavate, place soils or amend soils during wet or saturated conditions.

F. If lime treated soils have not been removed from proposed planting areas, remove and replace with acceptable topsoil.

G. Verify depth of planting soil in proposed planting areas. If depth of planting soil is less than twelve (12) inches in depth, install additional planting soil to ensure twelve (12) inch minimum depth of topsoil.

H. Import topsoil Installation:

1. Remove and disposed of stones larger than one (1) inch in any dimension, vegetation and foreign inorganic material from surface to receive import topsoil.

2. Scarify or plow the subgrade by crossripping or equivalent to a minimum depth of four (4) inches until it is loose and uncompacted to provide bonding of imported planting soil layer to subgrade.

3. Place planting soil on loosened material in four (4) inch layers. Crossrip first import planting soil layer to a depth of eight (8) inches and blend import planting soil with loose native surface soil. Roll lightly with appropriate lawn roller to consolidate soil and compact to 85% density.

4. Continue placement of planting soil after blending first layer with native soil in four (4) inch layers and rolling lightly to consolidate and compact each layer of soil and compact to 85% density.

5. Place topsoil to the lines and grades in accordance with grading Drawings.

I. Verify rough grading is completed to proper slopes and elevations.

J. Verify installation of topsoil to a minimum depth of twelve (12) inches and rough grading is completed to proper slopes and elevations.

3.3 SOIL AMENDING AND FINE GRADING (Amend per Soil analysis laboratory recommendations. The following amendment recommendations are given for bidding purposes only.) Contractor shall prepare and amend soil over entire planting areas and as recommended for backfill at individual planting pits.

A. Soil Preparation: Loosen subgrade of planting beds by crossripping or equivalent cultivation to a minimum depth of ten (10) inches. Remove stones larger than one (1) inch in any dimension and sticks, roots, rubbish, and other extraneous matter in the top six (6) inches of soil and legally dispose of them off Owner's property.

B. Soil Amending: (Amend per soil Analysis laboratory recommendations. The following recommendations are provided for bidding purposes only. Contractor shall amend soil for over-all preparation and amendment recommendations and for planting pit preparation, amendments and backfill) Add the following and thoroughly till into the top eight (8) inches of planting soil at the following rates per 1,000 square feet. Till planting soil to a homogeneous mixture of fine texture, free of lumps, clods, stones, roots and other extraneous matter. Float, rake and roll all planter areas to establish finished grades, maintaining drainage patterns and swales for grading and drainage plans, creating smooth, uniform surface plane.

1. 6 cubic yards nitrogen stabilized organic amendment per 1,000 square feet.

2. 14 pounds all-purpose granular fertilizer (6-20-20) per 1,000 square feet.

3. 15 pounds soil sulfur per 1,000 square feet.

C. Fine Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake,

remove ridges, and fill depressions to meet finish grades. Refer to civil grading plans and conform to designed grades, drainage patterns, swales, and ridges.
There shall be no areas that hold water or drain toward buildings or structures, unless designed per civil grading plans.

1. In planting areas, set finish grade of soil two (2) inches below adjacent paved surfaces, utility boxes, tops of curbs, and the like to allow for installation of organic mulch top dressing above.
2. Regrade as necessary to restore grades and drainage patterns after installation of plant material.

D. Compaction: Roll amended soil lightly with appropriate lawn roller to consolidate soil and compact to 85% density.

3.4 BIO-RETENTION SOIL AND INSTALLATION

A. Preparation:

1. Prior to installation of bio-retention soil, protect native soil at excavated bio-retention area from compaction by preventing traffic and installing a fence or covering with plywood.
2. Protect bio-retention soil stockpile from compaction and contamination from foreign matter by covering with a protective tarp.
3. Verify installation of subsurface and surface drainage with Civil Engineer prior to placing bio-retention soil.
4. Drainage should be directed away from bio-retention soils until upslope areas are stabilized and compacted.

B. Bio-Retention Soil Mixing and Placing:

1. Do not excavate, place soils or amend soils during wet or saturated conditions.
2. Operate equipment adjacent to bio-retention area and not in bio-retention area to avoid compaction.
3. If machinery must operate in the bio-retention area or adjacent planting area, use light weight, low ground-contact pressure equipment.
4. Where bio-retention soil meets native soil, rip or scarify the bottom native soils of the bio-retention area to a depth of four (4) inches.
5. If mixing bio-retention soil and amendments on-site, use an adjacent impervious area or plastic sheeting to prevent intrusion of foreign material.
6. Place bio-retention soil in 12” lifts. Do not place or work bio-retention soil if it is saturated or raining.
7. Allow bio-retention soil lifts to settle naturally, boot pack (walk around to compact) lifts to achieve 85% compaction or compact by lightly watering until soils are just saturated and allow bio-retention soils to dry between lifts.
8. Verify bio-retention soil elevations comply with grading design prior to applying mulch or installing plants.
9. After all lifts are placed, wait three (3) days to check for settlement, and add additional bio-retention soil as needed.

3.5 EDGING/HEADERBOARD INSTALLATION

A. Redwood Headerboard: Install wood headers or edgings where indicated. Anchor with wood stakes spaced per detail, driven at least 1 inch below top elevation of header or edging. Use 2 galvanized nails per stake to fasten headers and edging; length as needed to penetrate both members and provide 1/2-inch clinch at point. Chamfer top of stakes as indicated on detail and pre-drill stakes if needed to avoid splitting.

3.6 PLANT MATERIAL EXCAVATION

A. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Stake locations, outline areas, adjust locations when requested, and obtain Owner's Representative's acceptance of layout before planting. Make minor adjustments as required.

B. Lay out exterior plants at locations directed by Owner's Representative. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

C. Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation.

1. Excavate approximately planting pit sizes as indicated on planting details.
2. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots.
3. Set rootball onto compacted native soil so that rootball sits one (1) inch above adjacent finish grade.

D. Obstructions: Notify Owner's Representative if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

E. Drainage: Notify Owner's Representative if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

F. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.7 PLANT MATERIAL PLANTING

A. Place planting tablets in hole about one (1) to two (2) inches away from root tips. Refer to manufacturer's recommendation for exact quantity, but not less than:

Plant size	Quantity	Plant size	Quantity
1 gallon container	1	7 gallon container	5
2 gallon container	2	15 gallon container	8
3 gallon container	3	24" box container	20
5 gallon container	3	36" box container	30

B. Carefully remove root ball from container without damaging root ball or plant.

C. Set container grown planting stock plumb and in center of pit or trench with top of root ball one (1) inch above adjacent finish grades. Face plant material for best appearance.

D. Place amended backfill mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly.

E. Finish placing remainder of backfill mix. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil.

3.8 TREE AND SHRUB PRUNING

A. General Tree Pruning Procedures:

1. Prune trees according to ANSI A300 (Part 1). Prune trees for long term structural integrity.

2. Cut branches with sharp pruning instruments; do not break, tear or chop. Pruning Standards: Prune trees according to ANSI A300 (Part 1).

3. Do not apply pruning paint to wounds.

B. Pruning Goals (Prune as per the following and under the direction of a Certified Arborist):

1. Prune trees to remain to compensate for root loss caused by construction damage. Provide subsequent maintenance during landscape irrigation and planting maintenance period and until “final completion” as recommended by Certified Arborist.

2. Prune to remove dead wood, promote proper structure, thin and open canopy and for general health for the specific tree species.

3. Prune for clearance from structures, pathways and driveways and streets and for a balanced canopy.

C. Shrubs, Vines and Ground Covers:

1. Prune, thin and shape shrubs according to standard horticultural practices.

2. Prune to remove injured or dead branches from shrubs.

3.9 GUYING AND STAKING

A. Upright Staking and Tying: Unless detailed otherwise, use a minimum of 2 stakes of length required to penetrate at least six (6) inches below bottom of backfilled excavation and to extend at least 72 inches above grade. Set vertical stakes and space to avoid penetrating root balls or root masses. Brace tree stakes with wood horizontal bracing screwed in place. Support trees with two rubber tree tie sections at contact points with the tree trunk installed in a “figure 8” wrap. Allow enough slack to avoid rigid restraint of tree. Trim stakes below tree canopy and to matching heights. Unless indicated otherwise on Drawings, use the number of stakes as follows:

1. Use 2 stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper.

2. Use 3 stakes for trees more than 12 feet high and greater than 2-1/2 inches in caliper. Space stakes equally around trees.

B. Guying and Staking: Guy and stake trees exceeding 14 feet in height and more than 3 inches in caliper, unless otherwise indicated. Securely attach no fewer than 3 guys to stakes 30 inches long, driven to grade.

1. For trees more than 6 inches in caliper, anchor guys to pressure-preservative-treated deadmen 8 inches in diameter and 48 inches long buried at least 36 inches below grade. Provide turnbuckles for each guy wire and tighten securely.

2. Attach flags to each guy wire, 30 inches above finish grade.

3. Paint turnbuckles with luminescent white paint.

3.10 TREE ROOT BARRIERS

A. Install root barriers where trees are planted within six (6) feet of any pavement or structures.

B. A linear root barrier shall be installed flush with the vertical edge of pavement or structure, one half (1/2) inch below the top of the pavement and shall extend six (6) feet in each direction for a total of twelve (12) feet in length. Contractor shall remove concrete spillage if necessary to install barrier flush against vertical concrete edge.

3.11 TREE TRUNK GUARD:

A. install to protect newly planted tree trunks planted in lawns according to manufacturer recommendations.

3.12 RAISED PLANTERS

A. Fill raised planters with amended planting soil. Place planting soil in twelve (12) inch deep, compacted layers to 85% relative density to an elevation of four (4) inches below the top of the raised planter (unless detailed otherwise on Drawings).

3.13 POTTERY, PLANTING CONTAINERS AND/OR PREFABRICATED PLANTERS

A. Fill pottery, planting containers and prefabricated planters with potting soil. Compact in twelve (12) inch lifts and fill to three (3) inches of the top of the planter.

3.14 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants spaced as indicated on planting legend.

B. Dig holes large enough to allow spreading of roots, and backfill with planting soil.

C. Work planting soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

D. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

E. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.15 PRE-EMERGENT

A. Apply pre-emergent herbicide per manufacturer recommendations in new planting areas and bio-retention areas.

3.16 JUTE NETTING

A. Install jute netting on slopes exceeding 3:1 ratio slope. Apply jute netting after preparing planting soil for planting and fine grading. Secure jute netting starting at the top of the slope by laying six (6) inches of fabric below grade to a minimum depth of six (6) inches. Roll jute

netting down slope and terminate where grade becomes level by folding six (6) inches of fabric underneath. Overlap seems four (4) to six (6) inches. Secure in place using staples placed eighteen (18) inches on center spacing. After completion of planting operations, install top dressing/mulch as specified herein.

3.17 PLANTING BED MULCHING

A. Apply three (3) inch minimum thickness of organic mulch, unless specified otherwise on Drawings, continuously throughout planting areas. Do not place mulch within two (2) inches of stems and six (6) inches of tree trunks.

3.18 CLEANUP AND PROTECTION

A. During exterior planting, keep adjacent paving and construction work area in a clean and orderly condition.

B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation. Treat, repair, or replace damaged exterior planting.

C. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

3.19 MAINTENANCE SCHEDULE

A. Protection: Protect work from damage, erosion and trespass. Maintain temporary fencing and/or barriers in proper condition. Remove temporary fencing and/or barriers prior to final completion and at end of maintenance period.

B. Water: Contractor shall be solely responsible for ensuring that all planting is sufficiently watered to promote vigorous growth. Test and inspect irrigation system on a regular basis each week. Adjust and repair the irrigation system and its components as necessary for plant establishment and growth and for watering efficiency. Check and adjust any obstructions to emission devices.

C. Fertilizing (confirm with soil analysis laboratory recommendations): Immediately after completion of planting, fertilize landscape areas with ammonium sulfate (21-0-0) fertilizer at a rate of five (5) pounds per 1000 square feet. Fertilize with specified fertilizer after 45 days, prior to end of maintenance period. After landscape becomes well-established, fertilize in fall and spring with (16-6-8) commercial fertilizer at a rate of six (6) pounds per 1000 square feet.

D. Weed Control: Maintain planting beds (planted or not) in a weed-free condition to be performed weekly during maintenance period. Weeding may be done manually or by the use of selective herbicides. (Contractor shall obtain written approval from project owner prior to application of herbicide) No herbicide shall be used without the Owner Representative’s prior consent. Use only approved herbicides, use in accordance with manufacturer’s recommendations and per Pest Control Advisor’s recommendations. If selective herbicides are used, extreme caution shall be observed so as not to damage any other plants. Spraying shall be done only under windless conditions.

E. Disease, Pest and Insect Control: Disease, pest (including, but not limited to, birds and rodents) and insect damage shall be controlled by the use of fungicides, insecticides

pesticides, poisons and/or mechanical means. (Contractor shall obtain written approval from project owner prior to application of fungicides, insecticides or pesticides or mechanical methods). Review and perform weekly during maintenance period.

F. Plant Material: Maintain trees, shrubs and other plants by pruning, cultivating and weeding as required for healthy growth. Restore planting pits as necessary. Tighten and repair stake supports and reset trees and shrubs to proper grades or vertical position as required. Review and perform weekly during maintenance period.

G. Organic Mulch: Re-apply organic mulch top dressing after initial settling and again prior to end of maintenance to ensure specified depth is achieved.

H. End of maintenance shall be reviewed and approved in writing by Owner's Representative. Upon approval, Contractor shall notify Owner's Representative in writing when maintenance is complete with a date which maintenance transfers to Owner.

3.20 FIELD QUALITY CONTROL, SUBSTANTIAL COMPLETION AND FINAL COMPLETION

A. Owner's Representative shall inspect and approve the following prior to proceeding with subsequent work:

1. Preparation: at completion of finish grading and prior to planting, grading tolerances and soil preparation shall be checked for conformance to Drawings and as specified herein.

2. Layout: Layout of all plants, headerboard and other major elements shall be directed and/or approved by Owner's Representative.

3. Substantial Completion Review: At substantial completion of this Section, work shall be reviewed for conformance with the Drawings and Contractor shall make recommended repairs and/or corrections in a timely manner.

4. Final Completion Review: After substantial completion repairs and/or corrections have been completed, work shall be reviewed for final completion and approved by Owner's Representative in writing.

B. Re-inspections required due to Contractor not being prepared or non-conformance to Drawings shall be back charged to the Contractor.

C. Contractor shall remove protective fencing and/or barriers prior to final completion review.

END OF SECTION

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SECTION 32 92 00 – Turf Planting

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Sodding.

B. Related Sections include the following:

1. Specification Section 31 10 00 "Site Clearing" for topsoil stripping and stockpiling.
2. Specification Section 31 05 13 "Earthwork" for excavation, filling and backfilling, and rough grading.
3. Specification Section "Subdrainage" for subsurface drainage.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Import Topsoil: Shall be obtained from a local source and coming from a site with similar soil characteristics as the project site. Topsoil shall be fertile, friable, natural loam surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter and free of roots, stumps, stones and rocks and other extraneous or toxic matter harmful to plant growth.

C. Manufactured Topsoil: Soil produced off-site by homogeneously blending nutrients, minerals, soils or sand with stabilized organic soil amendments to produce surface planting soil capable of sustaining plant growth.

D. Planting Soil: On-site topsoil, import topsoil or manufactured topsoil.

E. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath topsoil.

F. On-site Topsoil: Naturally occurring, on-site, surface soil, usually occurring in the top four (4) to twelve (12) inches of original, undisturbed surface soil containing organic material, necessary nutrients and minerals to sustain plant growth and be approved to sustain plant life by an approved soil and plant lab.

G. Substantial completion for landscape and irrigation: Work shall be considered substantially complete when irrigation, planting, turf planting and seeding are installed correctly per plans and specifications with only minor adjustments required and approval has been submitted in writing by Owner's Representative.

H. Final completion for landscape and irrigation: Work shall be considered complete when irrigation, planting, turf planting and seeding are installed correctly per plans and specifications

and the maintenance period has been completed per plans and specifications and approval has been submitted in writing by Owner's Representative.

1.4 SUBMITTALS

A. Product and Material Data: For each type of product specified. Submit manufacturer's technical data and installation instructions for landscape products conforming to requirements of Section 01 33 00 Submittal Procedures to include, but not be limited to:

1. Analysis of proposed soil amending materials by soil analysis lab made according to methods established by the Association of Official Analytical Chemists, where applicable.
2. Samples for Verification: For each of the following:
    a. Soil conditioner (1/2 c.f. each).
3. Certification of turfgrass sod, identifying source, including name and telephone number of supplier.
4. Material Test Reports: For on-site topsoil, import topsoil and/or manufactured soil proposed for use on this project.
5. Planting soil amendments as recommended by soil testing lab.

B. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer shall be delivered to Owner's Representative upon delivery.

C. Qualification Data: For landscape Installer prior to performing work.

D. Planting Schedule: Indicating anticipated planting dates for turf installation.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Experience: The turf installation firm shall have contracted for and successfully completed construction of a minimum of five (5) California public school district construction projects, approved by the Division of the State Architect (DSA), within the past five (5) years of similar size, complexity, budget and scope.
2. Licensure: The turf installation firm shall hold a current, active C27 "Landscaping Contractor" license classification by the California State License Board that has been consistently active for at least five (5) years and that has not been suspended or revoked.
3. Supervision: The turf installation firm shall have a qualified and experienced turf technician on site during turf installation.

B. Soil Analysis Lab Qualifications: Testing lab shall be Lucchesi Plant and Soil Consulting, LLC., www.lucchesiconsulting.com, (408) 337-2575 or approved equal independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

A. Soil Analysis: Furnish soil analysis by a qualified soil analysis laboratory stating:

1. Percentages of organic matter.
2. Gradation of sand, silt, and clay content.

3. Cation exchange capacity (CEC) or total exchangeable cations (TEC).
4. Sodium absorption ratio.
5. Deleterious material.
6. pH.
7. Soluble salts, boron, mineral and plant-nutrient content.
8. Report suitability of planting soil for plant growth.
9. State recommended quantities of nitrogen, phosphorus and potash nutrients and soil amendments to be added to produce a satisfactory planting soil.

B. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section “Project Management and Coordination.”

C. Protect all lawn areas from damage or trespass by maintaining construction fencing during construction and maintenance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Sod: Harvest, deliver, store, and handle sod according to requirements in Turf Producers International's (TPI) "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in its "Guideline Specifications to Turfgrass Sodding."

1.7 SCHEDULING

A. Planting Restrictions: Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.8 LAWN MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Sodded Lawns: Maintenance period shall be a minimum of ninety (90) days from date of Owner’s Representative written approval of Substantial Completion and when there are no visible joints or bare patches, roots are thoroughly knit to the soil and lawn appears to be uniformly healthy and green in color.

B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and spraying for insects and disease and other operations. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn. Implement pest management as necessary to controls pests, including gophers.

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.

C. Watering: Provide and/or maintain temporary piping, hoses, and lawn-watering equipment as necessary to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of mulch.

2. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one third (1/3) of grass height. Remove no more than one third (1/3) of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow and edge before turf reaches three and one-quarter (3-1/4) inches high.
2. Cut to two and one-half (2-1/2) inches high.
3. Remove all clippings.

E. Lawn Post-fertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to lawn area.

F. Maintain protective barriers in place, erect and secure and clear of lawn edges to allow for uniform growth and for trimming and so as not to block irrigation spray pattern.

1.9 WARRANTY

A. All work executed under this Section shall be warranted free of defects and poor workmanship for a period of one (1) year after date of Final Completion.

B. Turf planting shall be warranted to be in healthy and thriving condition during Warranty period, except for defects resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents which are beyond Contractor’s control.

C. Repair and/or re-sod turf areas not in vigorous condition immediately upon notification by Owner’s Representative during Warranty period.

PART 2 - PRODUCTS

2.1 TURFGRASS SOD

A. Turfgrass Sod: Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with TPI's "Specifications for Turfgrass Sod Materials" in its "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted. Not less than 2 years old, free of weeds and undesirable native grasses and machine cut rolls to pad thickness of 5/8 inch.

B. Turfgrass Species: Sod of grass species as follows, with not less than 90 percent germination, not less than 95 percent pure seed, and free of weed seed:

1. Sod variety:
    a. 90/10 Tall Fescue blend of 90% tall fescue and 10% bluegrass.
    b. Available through Delta Bluegrass Co., www.deltabluegrass.com, (800) 637-8873.

C. Delivery, Storage and Handling: Sod shall be harvested, delivered and installed within a period of 24 hours. Sod shall be kept moist, fresh and protected at all times.

2.2 PLANTING SOIL

A. Prior to placing bid, Contractor to coordinate with General Contractor, Owner, Demolition and/or Grading Contractors and verify quantity and source of planting soil for turf planting areas. Identify Contractor responsible for stockpiling on-site topsoil and/or acquiring import planting soil and installing a minimum of six (6) inches of planting soil in turf planting areas and rough grading in accordance with these specifications, details, notes, grading and drainage plans.

B. Coordinate with General Contractor, Owner, Demolition and/or Grading Contractors for removal and replacement of any lime treated soils and replacement with planting soil prior to planting turf to depth required to remove lime treatment.

C. On-site topsoil: Reuse existing topsoil or existing surface soil, top twelve (12) inches, excavated and stockpiled on-site. Verify suitability of stockpiled surface soil to produce planting soil by submitting a sample to a soil testing laboratory. Acceptable on-site topsoil shall be ASTM D 5268, pH range of 5.5 to 7.5, representative of productive soils in the vicinity, a range of 4 to15 percent organic material content; free of stones one (1) inch or larger in any dimension, roots, plants, sod, clay lumps and other extraneous materials harmful to plant growth. Sodium absorption rate (SAR) shall not exceed 5.0, conductivity of the saturation extract solution shall not exceed 3.0, and boron concentration in the saturation shall not exceed 1.0 ppm. Fine gravel (2-5 mm) and coarse gravel (5-12 mm) content shall not exceed 30%.

D. Import Topsoil: Supplement with imported or manufactured topsoil from off-site, local sources, when quantities of on-site topsoil are insufficient. Do not obtain topsoil from bogs or marshes. If soil is obtained from agricultural land, Contractor shall submit proof soil is nematode free. Import topsoil shall meet the following requirements:

1. USDA Classification of fraction passing 2.0 mm sieve: sandy loam, sandy clay loam or loam.

2.

Class	Particle size range	maximum, %	minimum, %
Coarse Sand	0.5 – 2.0 mm	15	0
Silt	.002-.05 mm	30	10
Clay	<.002 mm	25	10
Other Classes			
Gravel	2-13 mm	15	0
Rock	½-1 inch	5% by volume with none >1 inch	
Organic		15	0

3. Chemistry – Suitability Considerations

Salinity: Saturation Extract Conductivity (ECe)
Less than 3.0 dS/m @ 25 degrees C.
Sodium: Sodium Adsorption Ratio (SAR)
Less than 6.00 ppm.
Boron: Saturation Extract Concentration
Less than 1.00 ppm.
Reaction: pH of Saturated Paste: 5.5 – 7.5 without high lime content.

4. Soil to contain sufficient quantities of available nitrogen, phosphorus, potassium, calcium and magnesium to support normal plant growth. In the event of nutrient inadequacies, provisions shall be made to add required materials prior to planting.

5. Soil testing: Contractor shall submit to the Owner's representative for approval, certification from an agricultural soils testing laboratory that the import topsoil provided conforms to the specifications prior to delivery of import or placement of on-site topsoil. Soil testing shall have been performed on import topsoil source within the previous year.

2.3 FERTILIZER AND SOIL AMENDMENTS

A. Contractor shall collect and submit two samples of proposed planting soil, representative of the top eight (8) inches of planting soil, to the locally known soil analysis lab for analysis and amendment recommendations. Soil samples shall be taken from proposed planting areas or topsoil source. Sample shall be taken to a depth of 8 inches. Contractor shall amend per soil testing laboratory recommendations. Soil amendments in this specification are provided for bidding purposes only.

B. If import topsoil is proposed, import topsoil sample shall be submitted to a soil analysis laboratory locally known for analysis, amendment recommendations and installation recommendations.

C. Contractor shall provide soil analysis laboratory, the following information when submitting soil for analysis:

1. Project type (public school, commercial building, etc.).
2. Anticipated maintenance (regular, low, none, etc.).
3. Irrigation water source (potable or recycled).
4. Proposed plant material type such as ornamental or sport turf.
5. Copy of this specification.

D. Fertilizers: All fertilizers shall be of an approved brand with a guaranteed chemical analysis as required by USDA regulations and shall be dry and (except for plant tabs) free flowing.

E. Nitrogen Stabilized Organic Soil Amendment: 0-1/4 inch nitrogen-stabilized organic amendment contributing at least 270 pounds of organic matter per cubic yard. Consider using Composted Greenwaste Organic Soil Amendment, such as Z-Best Organic Compost from Zanker Landscape Materials (www.zankerlandscapematerials.com) or equal, if recommended by soil analysis laboratory. Compost shall be obtained from a supplier participating in the Seal of Testing Assurance (STA) program of the U.S. Composting Council.

1. In order to comply with MWELO 492.6, 3. (C). Soil Preparation, Mulch and Amendments, at a minimum, compost shall be applied at a rate of four (4) cubic yards per 1,000 square feet of permeable area incorporated to a depth of six (6) inches into the soil. Soils with greater than 6% of organic matter in the top six (6) inches are exempt from adding compost.
2. Nitrogen stabilized sawdust shall not be used.

F. Soil Preparation: The following materials and quantities are given for bidding purposes only and Contractor shall amend soil using products, quantities and methods specified by soil analysis laboratory.

1. Nitrogen stabilized organic soil amendment.
2. Starter fertilizer, XB Best 6-20-20 or 6-24-24.
3. Soil sulfur.

2.4 HERBICIDES

A. All herbicides shall be approved by the District prior to use.

B. Contractor shall contact Owner's Representative prior to application of herbicides for Owner's policies, rules and regulations pertaining to herbicide application.

C. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application to remove broad-leaf weeds from existing turf.

D. Non-selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application to remove herbaceous vegetation in areas indicated.

2.5 WATER

A. Water shall be suitable for irrigation and free from ingredients harmful to sodded areas.

2.6 LANDSCAPE EDGINGS/HEADERBOARD

A. Wood Strip Edging: Of sizes shown, and as follows:

1. Wood Material: Construction heart redwood, 2 by 6 in size, length as required.
2. Stakes: Construction grade, rough sawn, wood, 2 by 2 by 16 inches long in nominal size, with galvanized, wood, screws for anchoring edging to wood strip edging.

2.7 TEMPORARY FENCING

A. Fencing to be 6' high, lightweight, chain link fabric and galvanized pipe panels fastened together with saddle clamps. Fence support shall be on-grade concrete blocks and/or steel flange type footings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Planting operations shall be performed when weather and soil conditions are suitable for planting.

3.2 PREPARATION

A. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

B. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

C. Install protective temporary fencing at perimeter of sod turf work area with a gate for construction and maintenance access. Gate shall be secured in the closed position when work is not being performed. Examine work to be performed and irrigation spray locations and install

fencing in optimal location to minimize disruption to turf spray locations and for ease of sod installation and maintenance.

1. Fence shall be installed prior to beginning turf planting and irrigation work.
2. Fence shall be removed after sod has established and can tolerate normal school sport and play activities and prior to end of maintenance.

D. Contact and obtain Owner's Representative, Local, State and Federal policies and procedures for regulating application of fertilizers, fungicides, insecticides, pesticides and herbicides. Contractor shall comply with all applicable policies and/or procedures for application, posting and notifications.

E. Import Planting Soil Installation:

1. Remove and dispose of stones larger than one (1) inch in any direction, vegetation and foreign inorganic material from surface to receive import topsoil.
2. Scarify or plow the subgrade by crossripping or equivalent to a minimum depth of four (4) inches until it is loose and uncompacted to provide bonding of imported topsoil layer to subgrade.
3. Place topsoil on loosened material in six (6) inch layers. Crossrip first import topsoil layer to a depth of eight (8) inches and blend import topsoil with loose native surface soil. Roll lightly with appropriate lawn roller to consolidate topsoil and compact to 85% density.
4. Continue placement of import topsoil after blending first layer with native soil in six (6) inch layers and rolling lightly to consolidate and compact each layer of topsoil.
5. Place topsoil to the lines and grades in accordance with grading Drawings.

F. Verify installation of planting soil to minimum depth of six (6) inches and rough grading completed to proper slopes and elevations.

G. Verify lime treated soils have been removed and replaced with acceptable planting soil.

3.3 SOIL AMENDING AND FINE GRADING (Amend per Soil-Testing Laboratory recommendations. The following recommendations are given for bidding purposes only.)

A. Prior to disturbing soil, apply non-selective herbicide to eradicate vegetation. Select herbicide(s) most appropriate for vegetation to remove. Follow manufacturer's recommendation for complete kill prior to continuing work, approximately two (2) days. Re-apply in event herbicide is washed off by rain or water and as required for complete eradication of vegetation.

B. Soil Preparation: Loosen subgrade of planting beds by crossripping or equivalent cultivation to a minimum depth of ten (10) inches. Remove stones larger than one (1) inch in any dimension and sticks, roots, rubbish, and other extraneous matter in the top six (6) inches of soil and legally dispose of them off Owner's property.

C. Soil Amending: (Amend per Soil-Testing Laboratory recommendations. The following recommendations are provided for bidding purposes only.) Add the following and thoroughly till into the top six (6) inches of planting soil at the following rates per 1,000 square feet. Till planting soil to a homogeneous mixture of fine texture, free of lumps, clods, stones, roots and other extraneous matter. Float, rake and roll all planter areas to establish finished grades, maintaining drainage patterns and swales for grading and drainage plans, creating smooth, uniform surface plane.

1. 6 cubic yards nitrogen fortified organic soil amendment.
    a. In order to comply with MWELO 492.6, 3. (C). Soil Preparation, Mulch and Amendments, at a minimum, compost shall be applied at a rate of four (4) cubic yards per 1,000 square feet of permeable area incorporated to a depth of six (6) inches into the soil. Soils with greater than six percent (6%) organic matter in the top six (6) inches are exempt from adding compost.
2. 14 pounds all-purpose granular fertilizer (6-20-20).
3. 15 pounds soil sulfur.

D. Fine Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Refer to civil grading plans and conform to designed grades, drainage patterns, swales, and ridges. There shall be no areas that hold water or drain toward buildings or structures, unless designed per civil grading plans.
    1. In sodded turf areas, one (1) inch below adjacent paved surfaces, utility boxes, tops of curbs, etc.

E. Moisten prepared lawn areas before planting if planting soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil conditions.

F. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

G. Compact soil to 85% density.

H. Apply starter fertilizer at manufacturer recommended rates.

3.4 SODDING

A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted planting soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
    1. Lay sod across angle of slopes exceeding 1:3.
    2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
    3. Hold sod clear of all tree trunks and tree staking, create a circular edge 12” clear of all tree trunks.

C. Saturate sod with fine water spray within two hours of planting. During first week, water daily or more frequently as necessary to maintain moist planting soil to a minimum depth of 1-1/2 inches below sod.

3.5 MAINTENANCE SCHEDULE

A. Protection: Protect work from damage, erosion and trespass. Maintain temporary construction fencing in proper condition until sod has established.

B. Water: Contractor shall be solely responsible for ensuring that all planting is sufficiently watered to promote vigorous growth. Test and inspect irrigation system on a regular basis, each week during plant establishment and monthly thereafter. Adjust and repair the irrigation system and its components as necessary for turf establishment and growth and for watering efficiency. Check and adjust any obstructions to emission devices.

C. Fertilizing (confirm with soil analysis lab recommendations): Immediately after completion of planting, fertilize landscape areas with ammonium sulfate (21-0-0) fertilizer at a rate of five (5) pounds per 1000 square feet. Fertilize with specified fertilizer after 45 days, prior to end of maintenance period. After landscape becomes well-established, fertilize in fall and spring with (16-6-8) commercial fertilizer at a rate of six (6) pounds per 1000 square feet.

D. Weed Control: Maintain planting beds (planted or not) in a weed-free condition to be performed weekly during maintenance period. Weeding may be done manually or by the use of selective herbicides. (Contractor shall obtain written approval from project owner prior to application of herbicide) No herbicide shall be used without the Owner Representative's prior consent. Use only approved herbicides, use in accordance with manufacturer's recommendations and per Pest Control Advisor's recommendations. If selective herbicides are used, extreme caution shall be observed so as not to damage any other plants. Spraying shall be done only under windless conditions. Review and perform weekly during maintenance period.

E. Lawns: Maintain lawns by watering, fertilizing weeding, trimming, mowing and other operations such as rolling, re-grading and replanting as required to establish a smooth, acceptable lawn, free of weeds, bare spots and rocks. All lawn areas shall be mowed regularly when grass reaches a height of three and one-quarter (3-1/4) inches and a minimum of two (2) days prior to end of maintenance period.

F. Disease, Pest and Insect Control: Disease, pest (including moles, gophers and geese) and insect damage shall be controlled by the use of fungicides, insecticides, pesticides or poisons. Contractor shall obtain written approval from project Owner prior to application of fungicides, insecticides or pesticides and shall abide by all posting requirements prior to application. Review and perform weekly during maintenance period.

3.6 FIELD QUALITY CONTROL, SUBSTANTIAL COMPLETION AND FINAL COMPLETION

A. Contact Owner's Representative a minimum of 48 hours prior notice for review and approval of the following prior to proceeding with subsequent work:

1. Preparation: at completion of finish grading and prior to planting, grading tolerances and soil preparation shall be checked for conformance to Drawings and as specified herein.
2. Layout: Layout of sod, headerboard and other major elements shall be directed and/or approved by the Owner's Representative.
3. Substantial Completion Review (Pre-maintenance review): At substantial completion of this Section, work shall be reviewed for conformance with the Drawings. Written approval shall mark beginning of the maintenance period.
3. Final Completion Review: At the end of specified maintenance period, work shall be reviewed for conformance with Drawings including additional requirements stipulated during maintenance period shall be extended at Contractors sole cost as directed by the Owner's Representative.

4. Re-inspections required due to Contractor not being prepared or non-conformance to Drawings shall be back charged to the Contractor.

B. Satisfactory Sodded Lawn: At end of maintenance period, a healthy, well-rooted, even-colored, viable lawn has been established, free of weeds, open joints, bare areas, and surface irregularities. Construction fencing shall be removed and any voids in sod due to construction fencing shall be repaired.

C. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory and upon written approval of Owner.

3.7 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

C. Remove erosion-control measures after grass establishment period.

END OF SECTION

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