PENDLETON ELEMENTARY SCHOOL–
NEW SOCCER FIELD

DSA File No. 30-4
App. No. 04-124678
PTN. 66456-69

BUENA PARK SCHOOL DISTRICT

SEPTEMBER 15, 2025

PROJECT #25030

Studio W Architects

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 04-124678 INC:
REVIEWED FOR
SS ☐ FLS ☑ ACS ☑
DATE: 10/15/2025

STUDIO W ARCHITECTS

SEALS PAGE

BUENA PARK SCHOOL DISTRICT
MABEL L. PENDLETON ELEMENTARY SCHOOL

OWNER:
Name : Buena Park School District
Address: 6885 Orangethorpe Avenue
Buena Park, CA, 90620

ARCHITECT:
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Sacramento, CA 95811

BY:_____
Brian P. Whitmore, AIA CA 30345

ELECTRICAL:
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BY:_____
Ed David E18809

CIVIL ENGINEER:
KPFF
140 Newport Center Drive, Suite 100
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BY:_____
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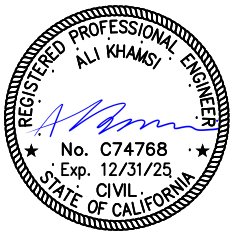

LANDSCAPE ENGINEER:
RIDGE Landscape Architects
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Irvine , CA, 92618

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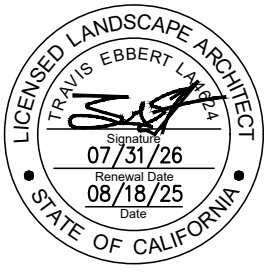

STATE OF CALIFORNIA – DIVISION OF STATE ARCHITECT

TABLE OF CONTENTS

END OF TABLE OF CONTENTS

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Work covered by the Contract Documents.
2. Use of premises.
3. Work restrictions.
4. Specification formats and conventions.
5. Pollution Control.
6. Storm Water Pollution Prevention Plan.
7. Lead-Containing materials.
8. Additional DSA requirements.

B. Related Sections include the following:
1. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Pendleton Elementary School – New Soccer Field.

B. Owner: Buena Park School District.

C. Project Address: 7101 Stanton Ave. Buena Park, California 90621.

D. Architect: Studio W Architects.

E. The Work consists of the following:
1. The Work includes construction of new soccer field and as indicated on Drawings.
2. The intent of these drawings and specifications is that the alteration, rehabilitation or reconstruction is to be in accordance with Title 24, California Code of Regulations. Should any existing conditions such as deterioration or non-complying construction be discovered which is not covered by the contract documents wherein the finished work will not comply with Title 24, California Code of Regulations, a Construction Change Document, or a separate set of plans and specifications, detailing and specifying the required repair work shall be submitted to and approved by Division of the Sate Architect before proceeding with the repair work.

1.3 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.

B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1.4 WORK RESTRICTIONS

A. On-Site Work Hours:
   1. Work shall be generally performed inside the existing building during normal business working hours, Monday through Friday, except otherwise indicated.

1.5 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 49-division format and CSI's MasterFormat 2004 numbering system.
   1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
   2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
   2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
      a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.6 POLLUTION CONTROL

A. Provide positive methods, means and facilities required to prevent contamination of the soil, water or atmosphere by the discharge of noxious substances from the construction operations.

1.7 STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

A. The contractor shall submit a Storm Water Pollution Prevention Plan for approval by the City’s Public Works and Community Development Departments. The plan shall show erosion control measures and indicate locations of staging, fueling, equipment and employee parking, and

storage/stockpile locations. Locations for concrete washout shall be shown, as well as gravel site entrances and/or metal grates to keep soil from being deposited on City streets. The plan shall note that street sweeping shall occur as often as necessary, to ensure that no dirt or dust will remain on City streets. Drip pans shall be used under parked equipment and visqueen shall be shown on the plan to protect the soil in the fueling area. Only minor vehicle maintenance shall occur on-site. Maintenance shall occur in the fueling area and soil shall be protected by drip pans and visqueen.

B. Prepare a Storm Water Pollution Prevention Plan (SWPPP) and file a Notice of Intent with the State Water Resources Control Board for this project. The SWPPP will provide Best Management Practice (BMP) methods and controls for wet weather grading activities and erosion control for both onsite and offsite improvements, in accordance with the requirements of the NPDES General Permit for Storm Water Discharges Associated with Construction Activity. The SWPPP shall include an erosion control plan.

1.8 MISCELLANEOUS PROVISIONS

A. General: Comply with the Project Conditions of Approval for both noise and dust control. If there is any conflict between drawings and specifications and the Project Conditions of Approval regarding noise and dust control, the Project Conditions of Approval shall govern.

B. Noise Control: The Contractor shall install noise reducing devices on construction equipment. Contractor shall comply with the requirements of the city and county having jurisdiction with regard to noise ordinances governing construction sites and activities. Construction Equipment noise at the Site shall be limited and only as permitted by applicable law, rule or regulation. If classes are in session at any point during the progress of the Work, and, in the Owner's reasonable discretion, the noise from any Work disrupts or disturbs the students or faculty or the normal operation of Owner, at the Owner's request, the Contractor shall schedule the performance of all such Work around normal hours or make other arrangements so that the Work does not cause such disruption or disturbance. In no event shall such arrangements result in adjustment of the Contract Price or the Contract Time.

C. Dust Control. The Contractor shall be fully and solely responsible for maintaining and upkeeping all areas of the Site and adjoining areas, outdoors and indoors, free from flying debris, grinding powder, sawdust, dirt and dust as well as any other product, product waste or work waste, that by becoming airborne may cause respiratory inconveniences to persons, particularly to students and Owner's personnel. Additionally, the Contractor shall take specific care to avoid deposits of airborne dust or airborne elements. Such protection devices, systems or methods shall be in accordance with the regulations set forth by the EPA and OSHA, and other applicable law, rule or regulation. Additionally, the Contractor shall be the sole party responsible to regularly and routinely clean up and remove any and all deposits of dust and other elements. Damage and/or any liability derived from the Contractor's failure to comply with these requirements shall be exclusively at the cost of the Contractor, including, without limitation, any and all penalties that may be incurred for violations of applicable law, rule or regulation, and any amounts expended by the Owner to pay such damages shall be due and payable to the Owner on demand. Contractor shall replace any damages property or part thereof and professionally clean any and all items that become covered or partially covered to any degree by dust or other airborne elements. If classes are in session at any point during the progress of Work, and, in the Owner's reasonable discretion, flying debris, grinding powder, sawdust, dirt or dust from any Work disrupts or disturbs the students or faculty or the normal operation of the college, at the Owner's request, the Contractor

shall schedule the performance of all such Work around normal college hours and make other arrangements so that the Work does not cause such disruption or disturbance. In no event shall such arrangements result in adjustment of the Contract Price or the Contract Time.

1.9 LEAD-CONTAINING MATERIALS.

A. The Contractor shall assume that all ceramic tile and painted or varnished surfaces in the school district contain detectable levels of lead which trigger compliance with California Code of Regulation, Title 8, Section 1532.1. In addition, waste products from these materials could contain lead at levels which are subject to the hazardous waste requirements in the California Code of Regulations, Title 22, Sections 666260.1 - 66263.12 and 66268.1 - 66268.124 and the health and Safety Code Section 25157.8 and 25163, subdivision (c).

B. It is the Contractor's responsibility to handle and dispose of these materials in accordance with the regulations. If failure to comply with these regulations results in a site or worker contamination, the Contractor will be held solely responsible for all costs involved in any required corrective action.

C. Lead-based paint should be removed only by professionals trained in hazardous material removal. A trained professional must follow very detailed procedures to minimize, control and contain lead dust generated by the removal process.
   1. The room should be sealed from the rest of the building. All furniture, carpets and drapes should be removed.
   2. Workers should wear respirators designed to avoid inhaling lead.
   3. No eating or drinking should be allowed in the work area. All food and eating utensils should be removed from the room. All cabinets as well as food contact surfaces should be covered and sealed.
   4. Occupants should be kept out of the room until the job is completed.
   5. Clothing worn in the room should be disposed of after working. The work clothing should not be worn in other areas of the building.
   6. Debris should be cleaned up using special vacuum cleaners with HEPA (high efficiency particle absorption) filters. A wet mop should be used after vacuuming.

1.10 ADDITIONAL DSA REQUIREMENTS

A. Comply with the following:
   1. Compliance with Title 24, for Parts 1-6 and 9.
   2. Title 24, Parts 1-5 shall be kept on site during construction.
   3. If any conflict or inconsistencies exist between the specifications and the drawings (including the general notes), more stringent requirements shall take precedence.
   4. Addenda:
      a. In accordance with Section 4-338(a) of the California Administrative Code, changes or alterations of the approved plans and specifications prior to the letting of a construction contract for the Work shall be made by means of addenda, which shall be submitted to and approved by Division of the Sate Architect (DSA) prior to distribution to contractors.
      b. Addenda shall be stamped and signed by Architect or Engineer in general responsible charge of preparation of the plans and specifications, and by the

Architect or Engineer delegated responsibility for the portion affected by the addenda.

c. Addenda issued during bidding, if any, will be inserted following this page in the Contract Documents sets issued for construction. The provision of all addenda shall become part of the Contract Documents and Contractor shall be obligated to construct the Project in accordance with the Contract Documents as modified or supplemented by the addenda provisions.

5. All substitutions affecting DSA regulated items shall be considered as a Construction Change Document or Addenda, and shall be approved by DSA prior to fabrication and installation. (IR-A6) (Section 4-338(c), Part 1)
6. Construction Change Document (Section 4-338 (c), Part 1) must be signed by all the following:
   a. A/E of Record.
   b. Owner (change order only).
   c. SEOR (when applicable).
   d. Delegated Professional Engineer (when applicable).
   e. DSA.
7. Project Inspector and testing lab must be employed by the Owner and approved by all of the following:
   a. A/E of Record.
   b. SEOR (when applicable).
   c. DSA.

B. Tests and Inspections - Chapter 17A:
1. All tests shall be performed by a testing facility acceptable to the architect and DSA. The testing facility shall be directly employed by the school district and no other entity or individual. Section Title 24, Part 1, Section 4-333 and 4-335.
2. Test reports shall be addressed to, and sent to, the school district by the testing facility. Copies of all test reports shall be sent to DSA, the architect, the structural engineer, and the project inspector by the testing facility. All reports shall be sent within 14 days of the date of the test. See Title 24, Part 1, Section 4-333 and 4-335.
3. A Verified Report, sighed by the California licensed civil engineer in charge of the testing facility which conducted the tests, shall be submitted to DSA upon completion of the project. The verified report shall state that all tests and inspections were made as required by the DSA approved documents. If the tests or inspections indicate that materials or workmanship did not meet the requirements of the DSA approved documents, the Verified Report shall list all noncompliant work. A copy of all test reports involving unresolved noncompliant work shall be attached to the Verified Report. In the event that not all required tests or inspections were made by the testing facility making this verified report, those tests and inspections not made shall be listed on the Verified Report. See Title 24, Part 1, Section 4-333 and 4-335.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:
   1. Division 1 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.2 MINOR CHANGES IN THE WORK

A. Architect may issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, or Changes not affecting the Structural Safety, Access Compliance or Fire & Life Safety portions of the work, on AIA Document G710, "Architect's Supplemental Instructions" or an equivalent form acceptable to District and subject to DSA IR A-6 Construction Change Document Submittal and Approval Process (Title 24, Part 1, California Code or Regulations, Section 4-338) requirements for DSA Construction Change Document – Category B.

1.3 PROPOSAL REQUESTS (BULLETIN)

A. Owner-Initiated Proposal Requests: Architect may issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Proposal Requests issued are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.
      d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

1.4 CONSTRUCTION CHANGE PROCESS - DSA

A. Changes or alterations of the approved plans or specifications after a contract for the work has been let affecting the Structural, Access or Fire-Life Safety portions of the project shall be made only by means of Construction Change Documents submitted to and approved by DSA prior to commencement of the work shown thereon. Construction Change Documents shall comply with DSA IR A-6 Construction Change Document Submittal and Approval Process (Title 24, Part 1, California Code or Regulations, Section 4-338) requirements. Construction Change Documents shall be made using DSA form 141 and state the reason for the change and the scope of work to be accomplished, and, where necessary, shall be accompanied by supplementary drawings referenced in the text of the change order. All Construction Change Documents and supplementary drawings shall be stamped and signed by the architect or engineer in general responsible charge of observation of the work of construction of the project and by the architect or registered engineer delegated responsibility for observation of the portion of the work of construction affected by the change order, shall bear the approval of the school board and shall indicate the associated change in the project cost, if any. One copy of each Construction Change Documents is required for the files of DSA.

B. Construction Change Documents shall be signed by Architect of Record, Owner, Structural Engineer (when applicable), Delegated Professional Engineer (when applicable), and DSA.

C. No changes shall be made to approved documents without DSA approval.

D. All Construction Change Documents shall be signed by Architect and approved by DSA.

1.5 CONSTRUCTION (FIELD) CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:
   1. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with Continuation Sheets.
      b. Submittals Schedule.
      c. Contractor's Construction Schedule.
   2. Submit the Schedule of Values to Architect at earliest possible date but no later than 7 days before the date scheduled for submittal of initial Applications for Payment.
   3. No payment applications will be signed by the Architect prior to the Contractor submitting, and the Architect reviewing, a schedule of values.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the Schedule of Values:
      a. Project name and location.
      b. Name of Architect.
      c. Architect's project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Submit draft of AIA Document G703 Continuation Sheets.
   3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
      a. Related Specification Section or Division.
      b. Description of the Work.
      c. Name of subcontractor.
      d. Name of manufacturer or fabricator.
      e. Name of supplier.
      f. Change Orders (numbers) that affect value.

g. Dollar value.
1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
   a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times:
   1. The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
   1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
   2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors.
   2. Schedule of Values.
   3. Contractor's Construction Schedule (preliminary if not final).
   4. Products list.
   5. Schedule of unit prices.
   6. Submittals Schedule (preliminary if not final).
   7. List of Contractor's staff assignments.
   8. List of Contractor's principal consultants.
   9. Copies of building permits.
   10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
   11. Initial progress report.
   12. Report of preconstruction conference.
   13. Certificates of insurance and insurance policies.
   14. Data needed to acquire Owner's insurance.
   15. Initial settlement survey and damage report if required.

G. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
   2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
   5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
   6. AIA Document G707, "Consent of Surety to Final Payment."
   7. Evidence that claims have been settled.
   8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
   9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. Project meetings.
   2. Requests for Interpretation (RFIs).

B. Related Sections include the following:
   1. Division 1 Section "Submittal Procedures" for electronic submittals.
   2. Division 1 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
   3. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   4. Division 1 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.2 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.
   4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's Construction Schedule.
   2. Preparation of the Schedule of Values.

3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.3 SUBMITTALS

A. Submit electronic submittals directly to extranet specifically established for Project.

1.4 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
4. Frequency of Attendance by Architect: Limited by Architect/Owner Contract.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
a. Tentative construction schedule.
b. Phasing, if any.
c. Critical work sequencing and long-lead items.
d. Designation of key personnel and their duties.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for RFIs.
g. Procedures for testing and inspecting.
h. Procedures for processing Applications for Payment.
i. Distribution of the Contract Documents.

j. Submittal procedures.
k. Preparation of Record Documents.
l. Use of the premises.
m. Work restrictions.
n. Owner's occupancy requirements.
o. Responsibility for temporary facilities and controls.
p. Construction waste management and recycling.
q. Parking availability.
r. Office, work, and storage areas.
s. Equipment deliveries and priorities.
t. First aid.
u. Security.
v. Progress cleaning.
w. Working hours.

3. Minutes: Record and distribute meeting minutes electronically.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
a. The Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility problems.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written recommendations.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at regular intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
        1) Review schedule for next period.
    b. Review present and future needs of each entity present, including the following:
        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Work hours.
        10) Hazards and risks.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Status of correction of deficient items.
        14) Field observations.
        15) RFIs.
        16) Status of proposal requests.
        17) Pending changes.
        18) Status of Change Orders.
        19) Pending claims and disputes.
        20) Documentation of information for payment requests.
3. Minutes: Record the meeting minutes electronically.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
    a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.5 RFIs:

A. General:
1. Contractor may submit a RFI to the Architect seeking clarification or interpretation of the contract documents. If in the Contractor's opinion the nature of the RFI requires a discussion, rather than simply an answer, the Contractor shall call the Architect to have such a discussion. The results of that discussion as well as all other RFI's must be presented in writing on a form approved in advanced by the Architect along with any supporting information or data, as well as the Contractor's recommended resolution. An oral RFI or a RFI presented on an unapproved form, or without adequate supporting information and Contractor's recommended solution, will be attributed solely to the contractor. Architect's review of or responses to RFI's shall not constitute an approval, direction, or procedure related to the construction means, methods, techniques, sequences, or procedures of the Contractor.
2. Architect's review of or responses to RFI's shall not constitute an approval, direction, or procedure related to the construction site safety precautions, procedures, or methodology of the Contractor.
3. The use of a RFI is limited to clarification of the contract documents. Contractor will limit each RFI to a single issue. Information which is discernable from the contract documents; construction means and methods; product substitution submittals; product submittals; and construction site safety will not be addressed by the Architect in responding to a RFI.
4. Architect's response to a RFI is not a change order or directive authorizing an increase in construction cost or time.

B. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

C. Frivolous or Unnecessary RFIs: Cost of design professional’s time will be billed or deducted from progress payment.

D. Electronic RFIs: Follow vendor’s instruction.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.

E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow 21 days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for coordination information already indicated in the Contract Documents.
d. Requests for adjustments in the Contract Time or the Contract Sum.
e. Requests for interpretation of Architect's actions on submittals.
f. Incomplete RFIs or RFIs with numerous errors.
2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.

3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 1 Section "Contract Modification Procedures."
    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

F. RFI Log: Prepare, maintain, and submit as instructed by electronic submittal vendor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 FORMS

A. Electronic versions of attached forms will be provided upon request.
    1. RFI Form.

END OF SECTION 013100

RFI FORM

STUDIO W ARCHITECTS

Project Name: **RFI No.:**

Project No.:

To: **Date:**

From:

Subject:

Discipline: **Category:**

Specification Section Title:

Section No.: **Page:** **Article/Paragraph:**

Sheet No.: **Detail:**

Question:

Suggestion:

☐ **Attachment:**

Undersigned certifies:

- Both drawings and specification sections were thoroughly reviewed.
- Processing time for frivolous RFIs will be charged back to Contractors at A/E billable rates.

Desired Response Date: (However, A/E still have specified days to respond.)

Cost Impact: **Schedule Impact:** days

Drawing Impact: **Submitted by:**

Signed: **Date:**

Answer:

Answered by:

Signed: **Date:**

Copies: ☐ **Owner** ☐ **Consultants** ☒ ☐ ☐ **File**

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1. A/E review of or responses to RFI's shall not constitute an approval, direction, or procedure related to the construction site safety precautions, procedures, or methodology of the Contractor.
2. The use of a RFI is limited to clarification of the contract documents. Contractor will limit each RFI to a single issue. Information that is discernable from the contract documents; construction means and methods; product substitution submittals; product submittals; and construction site safety will not be addressed by the A/E in responding to a RFI.
3. A/E response to a RFI is not a change order or directive authorizing an increase in construction cost or time.

End of RFI Form

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Contractor's Construction Schedule.
   2. Submittals Schedule.
   3. Three Week Look-Ahead Schedule.
   4. Daily construction reports.

B. Related Sections include the following:
   1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
   2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
   3. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
   4. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.2 SUBMITTALS

A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
   1. Scheduled date for first submittal.
   2. Specification Section number and title.
   3. Submittal category (action or informational).
   4. Name of subcontractor.
   5. Description of the Work covered.
   6. Scheduled date for Architect's final release or review.

B. Contractor's Construction Schedule: Submit three opaque copies of schedule, large enough (minimum 11 x 17) to show entire schedule for entire construction period.

C. Daily Construction Reports: Submit two copies at weekly intervals.

1.3 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Concurrent with the development of the Contractor's construction schedule, prepare a complete schedule of submittals. Submit the submittal schedule with the Contractor's construction schedule described above.
   1. Coordinate submittal schedule with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.
   2. The Architect will review the schedule and indicate which submittals may be deleted from the submission requirement. The deletion of the submittal requirement for an item does not release the Contractor from any requirements of the Construction Contract, General Conditions or Plans and Specifications.

B. Prepare the schedule in chronological order; include submittals required during the first 90 days of construction. Provide the following information:
   1. Scheduled date for the first submittal.
   2. Related Section number.
   3. Submittal category.
   4. Name of subcontractor.
   5. Description of the part of the Work covered.
   6. Scheduled date for resubmittal.
   7. Scheduled date the Architect's final release or review.

C. Distribution: Following response to initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the project meeting room and field office.
   1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

D. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule. Submit within 15 days of the date established for "Commencement of the Work". The Construction Schedule must be submitted and accepted prior to approval of first pay application.
   1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as identified in the "Schedule of Values".

2. Within each time bar indicate estimated completion percentage in 10 percent increments. As work progresses, place a contrasting mark in each bar to indicate Actual Completion.
3. Prepare the schedule on a sheet, or series of sheets, of stable reproducible media, of sufficient width to show data for the entire construction period.
4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.
5. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.
6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.

B. Phasing: Provide notations on the schedule to show how the sequence of the Work is affected by requirements for phased completion to permit work by separate Contractors and partial occupancy by the Owner prior to Substantial Completion.

C. Work Stages: Indicate important stages of construction for each major portion of the Work, including testing and installation.

D. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the Work. Indicate where each element in an area must be sequenced or integrated with other activities.

E. Cost Correlation: At the head of the schedule, provide a two item cost correlation line, indicating "pre-calculated" and "actual" costs. On the line show dollar-volume of work performed as of the dates used for preparation of payment requests.
1. Refer to Section "Payment Procedures" for cost reporting and payment procedures.

2.3 THREE WEEK LOOK-AHEAD SCHEDULE

A. Prepare weekly (or as determined by scheduled meeting times), prior to Project meetings, a computer-generated 3-week look-ahead schedule (bar chart) which is consistent with the Contractors schedule and depicts daily labor activities. The schedule will consist of the prior week, current week and the following 3 weeks.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions.
7. Accidents.

8. Meetings and significant decisions.
9. Unusual events (refer to special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial Completions and occupancies.
19. Substantial Completions authorized.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates changes, including, but not limited to, changes in durations, actual starts and finishes, and activity durations.
   3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of reviewed schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
   1. Post copies in Project meeting rooms and temporary field offices.
   2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.2 FORMS

A. Electronic versions of attached forms will be provided upon request.
   1. Submittals Schedule Form.

END OF SECTION 013200

SUBMITTAL SCHEDULE FORM

☐ Preliminary Submittal Schedule: Include submittals required during the first 60 days of construction.
☐ Complete Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

Project: From:

To: Date:

Scheduled Initial Submittal Date	Spec Section No.	Spec Section Title	Type: ☐ Action ☐ Info Only	Name of Subcontractor	Description	Scheduled Date of Approval

End of Submittal Schedule Form

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for electronically submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Consult individual sections of specifications for specific submittals required under those sections and for further details and descriptions of requirements.

C. Related Sections include the following:
1. Division 1 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
3. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
4. Division 1 Section "Quality Requirements" for submitting test and inspection reports.
5. Division 1 Section "Closeout Procedures" for submitting warranties.
6. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
7. Division 1 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
8. Division 1 Section "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.
9. Other Sections for specific requirements for submittals in those Sections.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

A. Processing: All costs for electronic submittal, printing, preparing, packaging, mailing, or delivering submittals for initial submittals and all costs for re-printing, re-drawing, re-drafting, re-packaging, re-submitting, and re-mailing or re-delivering as required for all re-submittals shall be included in Contract Sum.

B. Sequence: Transmit each submittal in sequence which will not result in Architect’s approval having to be later modified or rescinded by reason of subsequent submittals which should have been processed earlier or concurrently for coordination.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

D. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

E. Multiple Reviews: The Contractor shall also be responsible for all costs to Architect or Architect consultants for reviews requiring more than 2 reviews for same specification section.

F. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Review: Allow 21 days for review of each submittal. Architect will request for more time if needed.

G. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
   1. Note date and content of previous submittal.
   2. Note date and content of revision in label or title block and clearly indicate extent of revision.
   3. Resubmit submittals until they are marked “Approved” or “Furnish as Noted”.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals with mark indicating approval by Architect.

1.4 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
   1. Submit request using attached form at end of section.
      a. Indicate date, project name, contractor name, address, and specific drawing (sheet number) required.
      b. Signed by Contractor agreeing with terms and conditions.

PART 2 - PRODUCTS

2.1 ELECTRONIC SUBMITTALS

A. General: Prepare and submit Submittals required by individual Specification Sections.
   1. Submit electronic submittals directly to extranet specifically established for Project.
   2. Vendor:
      a. Submittal Exchange (Basis of Design)
      b. Or equal.
   3. Contractor shall pay for all-inclusive use of Submittal Exchange by all project team members; data storage, security, and backup; setup, training, and support; and archiving once construction is complete.
      a. Documentation processed, housed and archived shall include but not limited to: Submittals, Addendum, Plans, Specs, Field Reports, Photos, Weekly Reports, Notice of deviations, Punch List, RFI's RFP's ASI's, CCD's, Cost Proposals, Test Reports, Meeting Notes., and Close Out.

2.2 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
      a. Circle items applicable.
      b. Cross-out items not applicable.
      c. Select item number if required.
   3. Submittal data must include complete documentation relating to all the specified features
   4. Include the following information, as applicable:
      a. Manufacturer's Submittal Form with all the options selected when available.
      b. Manufacturer's written recommendations.
      c. Manufacturer's product specifications.
      d. Manufacturer's installation instructions.
      e. Standard color charts.
      f. Manufacturer's catalog cuts.
      g. Wiring diagrams showing factory-installed wiring.
      h. Printed performance curves.
      i. Operational range diagrams.
      j. Mill reports.
      k. Standard product operation and maintenance manuals.
      l. Compliance with specified referenced standards.
      m. Testing by recognized testing agency.
      n. Application of testing agency labels and seals.
      o. Notation of coordination requirements.
   5. Submit Product Data before or concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Dimensions.
      b. Do not use words "by others." Identify exactly who is responsible for the work.
      c. Identification of products.
      d. Fabrication and installation drawings.
      e. Roughing-in and setting diagrams.
      f. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
      g. Shopwork manufacturing instructions.
      h. Templates and patterns.
      i. Schedules.
      j. Design calculations.
      k. Compliance with specified standards.
      l. Notation of coordination requirements.
      m. Notation of dimensions established by field measurement.
      n. Relationship to adjoining construction clearly indicated.
      o. Seal and signature of professional engineer if specified.
      p. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
   2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
   3. Number of Copies: Submit 4 sets of prints and one electronic copy.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
   1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
   2. Identification: Attach label on unexposed side of Samples that includes the following:
      a. Generic description of Sample.
      b. Product name and name of manufacturer.
      c. Sample source.
      d. Number and title of appropriate Specification Section.
   3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
      a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
      b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
   4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
      a. Number of Samples: Submit 1 full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
   5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and

physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.
   1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
   2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.
2. Number and name of room or space.
3. Location within room or space.

F. Submittals Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."

2.3 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.
1. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
2. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."

B. Coordination Drawings: Comply with requirements specified in Division 1 Section "Project Management and Coordination."

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification

(WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

G. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

J. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

K. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

L. Schedule of Tests and Inspections: Comply with requirements specified in Division 1 Section "Quality Requirements."

M. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

N. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

O. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation

of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

P. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment.

Q. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

R. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

S. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

T. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

2.4 DEFERRED APPROVALS AND DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit 3 copies of a statement, signed and sealed by Structural Engineer Licensed in

California, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
   1. Coordinate the work; do not delegate responsibility for coordination to any subcontractor.
   2. Anticipate the interrelationship of all subcontractors and their relationship with the total work.
   3. Resolve differences or disputes between subcontractors and materials suppliers concerning coordination, interference, or extent of work between sections.
   4. Trade submittals with “By Others”, “By General Contractor”, or similar coordination and work scope are not allowed. Identify, acknowledge, and resolve scope of work prior to submittal by Contractor. No extras will be allowed. Provide complete and coordinated submittals.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

F. Architect’s and Consultant’s review shall neither be construed as complete check nor relieve the Contractor, Subcontractor, manufacturer, fabricator, or supplier from responsibility for any

deficiency that may exist or from any departures or deviations from the requirements of the Contract unless the Contractor has, in writing, called the Architect's attention to the deviations at the time of submission as specified.

3.3 FORMS

A. Electronic versions of attached forms will be provided upon request.
   1. Electronic Files Transfer - Architectural Form.

END OF SECTION 013300

Subject: Architectural Electronic Files

Date: _____

Contractor Name: _____

Address: _____

Project: _____

At your request, we will provide electronic files for your convenience and use in the preparation of shop drawings related to _____, subject to the following terms and conditions:

Our electronic files are compatible with AutoCAD. We make no representation as to the compatibility of these files with your hardware or your software beyond the specified release of the referenced specifications.

Data contained on these electronic files are part of our instruments of service and shall not be used by you or anyone else receiving these data through or from you for any purpose other than as a convenience in the preparation of shop drawings for the referenced project. Any other use or reuse by you or by others will be at your sole risk and without liability or legal exposure to us. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against us, our officers, directors, employees, agents or sub consultants that may arise out of or in connection with your use of the electronic files.

Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold us harmless against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising out of or resulting from your use of these electronic files.

These electronic files are not construction documents. Differences may exist between these electronic files and corresponding hard-copy construction documents. We make no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed or sealed hard-copy construction documents prepared by us and the electronic files, the signed or sealed hard-copy construction documents shall govern. You are responsible for determining if any conflict exists. By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with that of other contractors for the project.

Because information presented on the electronic files can be modified, unintentionally or otherwise, we reserve the right to remove all indicia of ownership and/or involvement from each electronic display.

We will furnish you electronic files of the following architectural drawings: _____.

Under no circumstances shall delivery of the electronic files for use by you be deemed a sale by us, and we make no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall we be liable for any loss of profit or any consequential damages as a result of your use or reuse of these electronic files.

If these terms are acceptable to you, please sign in the space provided below as evidence of our mutual understanding and agreement for this service. One signed copy of this agreement shall be returned to our office prior to delivery of the electronic files.

Very truly yours,

Architect

_____ _____

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:
   1. Division 1 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
   2. Other Sections for specific test and inspection requirements.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups:
   1. Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
   2. Comprehensive, completely integrated mockups of separate trades showing interface conditions, transitions, and relationships between materials and finishes.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

I. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of 5 previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Description of test and inspection.

3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:
1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A licensed professional engineer who is legally qualified to practice in California and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system,

assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An DSA approved NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.6 QUALITY CONTROL

A. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."

B. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

C. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspecting equipment at Project site.

D. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

E. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.
   1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes list of references.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. “AHJ”: Agency having jurisdiction.

C. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

D. “Compatible”: When used for products, it shall comply with requirements including products recommended/ required by the manufacturer for warrantee acceptance.

E. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

F. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

G. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

H. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

I. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

J. “Owner”: As defined in Division 1 section “Summary”.

K. "Provide": Furnish and install, complete and ready for the intended use.

L. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
   2. Copies of standards and applicable building codes (Title 24 Parts 1-5) shall be kept on-site during construction.

D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations.

E. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized names.

F. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized names.

G. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized names.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections include the following:
1. Division 1 Section "Summary" for limitations on utility interruptions and other work restrictions.
2. Division 1 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
3. Division 1 Section "Execution Requirements" for progress cleaning requirements.
4. Other Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.2 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

A. General: Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Sewer Service:
1. Owner's existing sewer system is available for use without metering but will be billed to Contractor for use charges.

C. Water Service:
1. Water from Owner's existing water system is available for use without metering but will be billed to Contractor for use charges. Provide connections and extensions of services as required for construction operations.

D. Electric Power Service:
1. Electric power from Owner's existing system is available for use without metering but will be billed to Contractor for use charges. Provide connections and extensions of services as required for construction operations.

E. Sanitary Facilities:

1. Pay sanitary service use charge for temporary toilets, wash facilities, and drinking water for use of construction personnel.

1.4 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with 2022 CEC.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized steel bases for supporting posts.

B. Wind Screen Fabric: Green.

2.2 TEMPORARY FIELD OFFICES

A. Not required.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
   1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Install temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Install temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Install temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Install electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

H. Lighting: Install temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
   2. Install lighting for Project identification sign.

3.3 SUPPORT FACILITIES INSTALLATION

A. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

B. Parking: Provide temporary or use designated areas of Owner's existing parking areas if approved for construction personnel.

C. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
   2. Remove snow and ice as required to minimize accumulations.

D. Project Identification and Temporary Signs: Provide Project identification. Install signs where directed to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
   1. Provide temporary, directional signs for construction personnel and visitors.
   2. Maintain and touchup signs so they are legible at all times.
   3. Provide a 4'-0" x 8'-0" project sign constructed of 1/2 inch plywood or 10 mil corrugated mounted to 4"x4" posts 8'-0" long set 2'-0" deep into earth.
   4. Project sign shall include a graphic of the building (available from the Architect), Architect, Consultants, District, project, funding members with titles, and Contractor with contact information for the contractor. Text and layout shall be submitted for approval prior to installation.
   5. Location of project sign shall be coordinated with District’s representative.

E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

F. Temporary Use of Permanent Stairs: Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
   1. Comply with work restrictions specified in Division 1 Section "Summary."

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
   1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
   1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations or as indicated on Drawings.
   2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

F. Install full coverage with green wind screen fabric to block viewing through construction fencing. Wind screen fabric shall be anchored or weighted sufficiently to resist design wind loads indicated on Drawings.

G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

J. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.
   1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
   2. Construct dustproof partitions with 2 layers of 3-mil polyethylene sheet on each side. Cover floor with 2 layers of 3-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant plywood.
      a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
   3. Insulate partitions to provide noise protection to occupied areas.
   4. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
   5. Protect air-handling equipment.
   6. Weather strip openings.
   7. Provide walk-off mats at each entrance through temporary partition.

K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
   2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 1 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and product substitutions.

B. Related Sections include the following:
   1. Division 1 Section "References" for applicable industry standards for products specified.
   2. Division 1 Section "Closeout Procedures" for submitting warranties for Contract closeout.
   3. Other Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor. Proposed products by manufacturers not listed in Manufacturers list.

C. Basis-of-Design: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating “or equal” products of other named manufacturers.

D. District Standard: Where a specific manufacturer's product is named and accompanied by the words "District Standard," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics pre-selected by the District.
   1. District seeks to match products currently in use on other campuses; No substitution allowed.

1.3 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
   1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
   2. Form: Tabulate information for each product under the following column headings:
      a. Specification Section number and title.
      b. Generic name used in the Contract Documents.
      c. Proprietary name, model number, and similar designations.
      d. Manufacturer's name and address.
      e. Supplier's name and address.
      f. Installer's name and address.
      g. Projected delivery date or time span of delivery period.
      h. Identification of items that require early submittal approval for scheduled delivery date.
   3. Completed List: Submit 3 copies of completed product list within days specified in General Conditions. Include a written explanation for omissions of data and for variations from Contract requirements.
   4. Architect's Action: Architect will respond in writing to Contractor within 21 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

B. Substitution Requests: Submit each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use form provided at end of Section.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified material or product cannot be provided.
      b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, environmental, and specific features and requirements indicated.
      d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      e. Samples, where applicable or requested.
      f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
      g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
      h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: Architect will notify Contractor of acceptance or rejection of proposed substitution within 21 days of receipt of request.
   a. Form of Acceptance: Change Order.
   b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

C. All substitutions affecting the Structural, Access or Fire-Life Safety portions of the project shall be submitted to DSA for approval as a Construction Change Directive in accordance with DSA IR A-6 Construction Change Document Submittal and Approval Process (Title 24, Part 1, California Code or Regulations, Section 4-338) requirements.

D. The cost for any additional design or engineering required to gain DSA approval of a substitution shall be borne solely by the contractor. Any delay impacts resulting from DSA review and approval of substitutions shall be borne solely by the contractor.

E. Named Product and Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

F. District Standard Products Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Changes to the approved drawings and specifications shall be made by an addendum or a Construction Change Document approved by the Division of the State Architect, as required by Section 4-338, Part 1, Title 24, CCR.

B. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to other sections for specific content requirements and particular requirements for submitting special warranties.

C. Warranty Period: Warranty period specified in each sections are minimum requirements. Do not modify manufacturer’s standard warranty period if the manufacturer’s warranty has longer warranty period.

D. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Architect will make selection.
   5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
   6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:
   1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
   2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
   3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
   4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
   5. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or an equal product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with “or equal”.
   6. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Product Substitutions" Article to obtain approval by Architect for use of an unnamed product.
   7. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
      a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
   8. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
      a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or

texture from manufacturer's product line that does not include custom or premium items.

b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes standard, custom, and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 35 days after the Notice to Proceed**.** Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction and has paid any fees.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
11. Furnish samples upon requested by Architect.
12. Attached Request for Substitution Form shall used for substitution requests.

C. Substitutions for products or systems involving structural, fire/life safety and access compliance will be considered a Construction Change Document or Addendum, and will require DSA approval. This will add time required to review those substitutions requiring DSA approval. Contractor is solely responsible for all documentation and time required to obtain DSA approval.

1. The use of a product other than specified or noted on the Drawings will require the Contractor to get Engineer, Architect and DSA approval.
2. The Contractor shall be responsible to provide any information, calculations or drawings to show compliance with the DSA approved drawings and provide all documentation to the Architect and/or Engineer of record.
3. Any changes or “substitutions” that impact or relate to DSA requirements for structural, ADA or fire and life safety MUST be approved by DSA prior to proceeding with the work.
4. The Contractor shall also be responsible for all costs to the DSA, Architect or Architect consultants for review, co-ordination, and approval by the DSA.

a. All costs for submittal to DSA and Architect/ design team expenses shall be back charged to the Contractor.

PART 3 - EXECUTION

3.1 FORMS

A. Electronic versions of attached forms will be provided upon request.
   1. Product List Form.
   2. Similar Installation List Form.
   3. Substitution Request Form.

END OF SECTION 016000

SUBSTITUTION REQUEST FORM

Substitutions are only allowed within number of days specified. Use this for m for requesting "or equal" products and materials.

Project:	Substitution Request Number:
	From:
To:	Date:
	Project Number:

Specification Section Title:		
Section Number:	Page:	Article/Paragraph:
Specified Item:		

Proposed Substitution:	
Manufacturer:	Address:
Contact Name:	Phone Number:
☐ Comparison between proposed substitution and specified product is attached. Note all differences.	

Reason for not using specified item:
☐ Specified product is no longer available.
☐ Substitution will improve lead time by _____ days
☐ Substitution will save Owner $ _____
☐ Other:

☐ List 3 similar installations including project name, address, owner, and date installed is attached.
Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explanation attached.

Supporting Data Attached:
☐ Product Data (indicate any options to be included)
☐ Drawings ☐ Test Reports ☐ Samples ☐ Color Chart ☐ Other:

Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable is available.
- Proposed substitution will not affect or delay Construction Progress Schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including architectural or engineering design, detailing, and construction costs caused by the requested substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

- Substitutions for products or systems involving structural, fire/life safety and access compliance will require AHJ approval. This will add time required to review those substitutions requiring AHJ approval. Contractor is solely responsible for all documentation, cost, and time required to obtain AHJ approval.

Submitted by:	Firm:
Signature:	Date:
Comments:	

A/E Review:
☐ Approve Substitution.
☐ Approve Substitution as Noted.
☐ Reject Substitution. Use specified product.
☐ Reject Substitution. Use specified product. Substitution request received too late.

Signed by:	Date:
Comments:	

Owner's Review and Action (Approval of substitution is not valid without Owner's signature)
☐ Substitution approved.
☐ Substitution approved as Noted.
☐ Substitution rejected. Use specified product.

Signed by:	Date:

Comments:

End of Substitution Request Form

PRODUCT LIST FORM

☐ Preliminary Product List.
☐ Complete Product List.
Include a written explanation for omissions of data and for variations from Contract requirements.

Project: ______________________________ From: ____

To: ______________________________ Date: ____

Spec Section		**Early approval?** ☐ **Yes** ☐ **No**	**Product**	**Model No.**	**Manufacturer**	**Supplier**	**Installer**	**Delivery Date**
No.	**Title**							

End of Product List Form

SIMILAR INSTALLATION LIST FORM

Provide minimum 5 similar installations within last 3 years.

Project: _____ From: _____

To: _____ Date: _____

	Date of Installation	Project Name	Owner Info	GC Info	Architect info
1					
2					
3					
4					
5					
6					
7					
8					

End of Similar Installation List Form

SECTION 017300 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
   1. General installation of products.
   2. Progress cleaning.
   3. Starting and adjusting.
   4. Protection of installed construction.
   5. Correction of the Work.

B. Related Sections include the following:
   1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
   2. Division 1 Section "Submittal Procedures" for submitting surveys.
   3. Division 1 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
   1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas, and water-service piping; and underground electrical services.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
   4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Provide protection against weather, rain, wind, storms, frost and heat so as to maintain all work and materials free from injury or damage.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.7 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for the following:
   1. Salvaging nonhazardous demolition and construction waste.
   2. Recycling nonhazardous demolition and construction waste.
   3. Disposing of nonhazardous demolition and construction waste.

B. Related Sections include the following:
   1. Division 1 Section "Temporary Facilities and Controls" for environmental-protection measures during construction.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 PERFORMANCE REQUIREMENTS

A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 75 percent by weight of total waste generated by the Work.

1.4 QUALITY ASSURANCE

A. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until installation.
   4. Protect items from damage during transport and storage.
   5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

C. Salvaged Items for Owner's Use:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's storage area designated by Owner.
   5. Protect items from damage during transport and storage.

D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
   1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
      a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.3 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
   1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. IOR's Inspection procedures.
   2. Warranties.
   3. Extra Materials.
   4. Final cleaning.
   5. DSA project closeout and Final Certification of Construction.

B. Related Sections include the following:
   1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
   2. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
   3. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
   4. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
   5. Division 1 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
   6. Other Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 DEFINITIONS

A. IOR: Inspector of Record.

B. Inspection: IOR will inspect, not the Architect.

1.3 SUBMITTALS

A. Submit a copy of Title 24 Certificate of Acceptance forms submitted to enforcement agency.

1.4 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting IOR's inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.

3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. IOR’s Inspection: Submit a written request for IOR’s inspection for Substantial Completion. On receipt of request, Architect will either proceed with IOR’s inspection process or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after IOR’s inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.5 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final IOR’s inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. IOR’s Inspection: Submit a written request for final IOR’s inspection process for acceptance. On receipt of request, Architect will either proceed with IOR’s inspection process or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after

IOR's inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use form attached.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

1.7 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date specified in General Conditions.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Include Table of Contents.
3. Identify content with specification section number and title.
4. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
5. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

1.8 EXTRA MATERIALS

A. Deliver to Owner's facility manager extra materials specified in each section.

B. Organize submitted materials in orderly sequence based on the table of contents of the Project Manual.

1. Itemize each material and quantity in 8-1/2 by 11-inch paper.

C. Label each items for easy identification.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
   1. Complete the following cleaning operations before requesting IOR's inspection for certification of Substantial Completion for entire Project or for a portion of Project:
      a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
      c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
      d. Remove tools, construction equipment, machinery, and surplus material from Project site.
      e. Remove snow and ice to provide safe access to building.
      f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
      g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
      h. Sweep concrete floors broom clean in unoccupied spaces.
      i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
      j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
      k. Remove labels that are not permanent.

l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
   1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean ducts, blowers, and coils if units were operated without filters during construction.
r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
s. Leave Project clean and ready for occupancy.

3.2 DSA PROJECT CLOSEOUT AND FINAL CERTIFICATION OF CONSTRUCTION

A. Verified Reports: Per Title 24 Part1, Section 4-336.

B. Final Certificate of Construction: Per Title 24 Part1, Section 4-339.

C. Duties of Contractor: Per Title 24 Part1, Section 4-343.

3.3 FORMS

A. Electronic versions of attached forms will be provided upon request.
   1. Punch-List Form.

END OF SECTION 017700

PUNCH-LIST FORM

☐ Preliminary Punch-List.
☐ Final Punch-List.

Project:	From:
To:	Date:

Item No.	Room No.	Area	Description	Completion Date	A/E Verification

End of Punch-List Form

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory.
   2. Emergency manuals.
   3. Operation manuals for systems, subsystems, and equipment.
   4. Maintenance manuals for the care and maintenance of products, materials, and finishes.

B. Related Sections include the following:
   1. Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
   2. Division 1 Section "Closeout Procedures" for submitting operation and maintenance manuals.
   3. Division 1 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
   4. Other Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 SUBMITTALS

A. Initial Submittal: Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return 1 copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Submit 1 copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
   1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

1.4 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:
1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
   1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
   1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
      b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
   4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
   5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
      a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
      b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:
   1. Type of emergency.
   2. Emergency instructions.
   3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
   1. Fire.
   2. Flood.
   3. Gas leak.
   4. Water leak.
   5. Power failure.

6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:
1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.

9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product,

list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
   1. Standard printed maintenance instructions and bulletins.
   2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   3. Identification and nomenclature of parts and components.
   4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   1. Test and inspection instructions.
   2. Troubleshooting guide.
   3. Precautions against improper maintenance.
   4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   5. Aligning, adjusting, and checking instructions.
   6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
   1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
   2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
   1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
   2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
   1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
   1. Do not use original Project Record Documents as part of operation and maintenance manuals.
   2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

G. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.

B. Related Sections include the following:
   1. Division 1 Section "Closeout Procedures" for general closeout procedures.
   2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
   3. Other Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.2 SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit 1 set of marked-up Record Prints.

B. Record Specifications: Submit 1 copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit 1 copy of each Product Data submittal.
   1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
   1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an understandable drawing technique.

c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:
   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations below first floor.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Changes made by Change Order.
   k. Changes made following Architect's written orders.
   l. Details not on the original Contract Drawings.
   m. Field records for variable and concealed conditions.
   n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
   1. Record Prints: Organize Record Prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
   2. Identification: As follows:
      a. Project name.
      b. Date.
      c. Designation "PROJECT RECORD DRAWINGS."
      d. Name of Architect.
      e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
   4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.

5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
   3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.
   4. Assemble in single binder with table of contents.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

3.2 FORMS

A. Electronic versions of attached forms will be provided upon request.
   1. Record Product Data Form.

END OF SECTION 017839

RECORD PRODUCT DATA FORM

Record Product Data is due no later than 10 calendar days after the date of Substantial Completion. Photocopy for continuation sheets. List products in order by specification section numbers.

Project Name:	From:
To:	Date:

Spec Section		**Originally Specified**		**Actually Installed**	
No.	**Title**	**Model**	**Manufacturer**	**Model**	**Manufacturer**

End of Record Product Data Form

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.

B. Related Sections include the following:
   1. Division 1 Section "Project Management and Coordination" for requirements for preinstruction conferences.
   2. Other Sections for specific requirements for demonstration and training for products in those Sections.

1.2 SUBMITTALS

A. Instruction Program: Submit 2 copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   1. At completion of training, submit 1 complete training manual(s) for Owner's use.

B. Qualification Data: For instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.3 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
1. Schedule training with Owner, through Architect, with at least 7 days' advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written performance-based test.

E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 017900

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Formwork for cast-in-place concrete as indicated.
2. Installation of items to be embedded in concrete, such as anchor bolts, inserts, embeds, and sleeves.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 032000: Concrete Reinforcing.
3. Section 033000: Cast-In-Place Concrete.

1.2 REFERENCES

A. American Concrete Institute (ACI) Publication:

1. ACI 318 – Building Code Requirements for Structural Concrete, Chapter 6, Formwork, Embedded Pipes, and Construction Joints.
2. ACI 347 – Guide to Formwork for Concrete.

B. American Plywood Association (APA):

1. Form No. V345 - Concrete Forming Design/Construction Guide.

C. National Institute of Standards and Technology (NIST):

1. NIST Voluntary Product Standard PS 1.

1.3 SUBMITTALS

A. Submit detailed structural calculations and drawings approved and signed by a California registered Civil Engineer where the height of the falsework or vertical shoring, as measured from the top of the sills to the soffit of the superstructure exceeds 14 feet, or where individual horizontal span lengths exceed 16 feet, or where provision for vehicular traffic through falsework or shoring occurs. For all other falsework and shoring submit layout signed by California registered Civil Engineer, manufacturer’s authorized representative or a licensed contractor experienced in the usage and erection of falsework and vertical shoring. A copy of the plans and calculation shall be available at the jobsite at all times.

B. Shop Drawings: Submit Shop Drawings indicating locations of forms, construction and expansion joints, embedded items, and accessories.

C. Product Data: Submit manufacturer's Product Data for form materials and accessories.

1.4 REGULATORY REQUIREMENTS

A. California Building Code (CBC), Chapter 19A.

B. California Code of Regulations, Title 8, Division 1, Chapter 4, Subchapter 4, Construction Safety Orders, Article 6, Excavations, Sections 1713 and 1717.

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage shall prevent damage and permit access to materials for inspection and identification.

PART 2 - PRODUCTS

2.1 GENERAL

A. Form materials may be reused during progress of the Work provided they are completely cleaned and reconditioned, recoated for each use, capable of producing formwork of required quality, and are structurally sound.

B. Form Lumber: WCLIB Construction Grade or Better, WWPA No. 1 or Better.

C. Plywood: NIST Voluntary Product Standard PS 1, Group 1, Exterior Grade B-B Plyform or better, minimum 5-ply and 3/4 inch thick for exposed locations and at least 5/8 inch thick for unexposed locations, grade marked, not mill oiled. Furnished plywood with medium or high density overlay is permitted.

D. Coated Form Plywood: For exposed painted concrete, plastic overlaid plywood of grade specified above, factory coated with a form coating and release agent Nox-crete", or equal.

E. Tube Forms: Sonoco "Seamless Sonotubes," Ceme-Tube, Quik-Tube, or equal, of the type leaving no marks in concrete, one-piece lengths for required heights.

F. Joist Forms: Code recognized steel or molded plastic types as required.

G. Special Forms: For exposed integrally-colored concrete, plywood as above with high density overlay, plywood with integral structural hardboard facing or fibrous glass reinforced plastic facing, providing specified finish.

H. For Exposed Concrete Finish:

1. Plywood: New, waterproof, synthetic resin bonded, exterior type Douglas fir or Southern pine plywood manufactured especially for concrete formwork and conforming to NIST Voluntary Product Standard PS 1, Grade B-B grade, Class I.

2. Glass-Fiber-Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surfaces.

3. Steel: Minimum 16 gage sheet, well matched, tight fitting, stiffened to support weight of concrete, without deflection detrimental to tolerances and appearances of finished concrete surfaces.

4. Plywood: "Finland Form", "Combi Form" by North American Plywood Corporation, "Plyform" by Roy O. Martin, "ProForm" by Pacific Wood Laminates, or equal. The material shall be furnished with hard smooth birch face veneers with phenolic resin thermally fused onto panel sides. Edges shall be factory sealed.

I. Form Ties: Prefabricated rod, flat band, wire, internally threaded disconnecting type, not leaving metal within 1 1/2-inch of concrete surface.

J. Form Coating: Non-staining clear coating free from oil, silicone, wax, not grain-raising, "Formshield" by A.C. Horn, Inc., "Release" by Edoco/Dayton Superior, "Cast-Off" by Sonneborn/BASF Building Systems or equal. Where form liners are furnished, provide form coatings recommended by form liner manufacturer.

K. Form Liner: Rigid or resilient type by L.M. Scofield, Symons, Greenstreak, or equal.

L. Void Forms: Manufactured by SureVoid Products, Inc., Sonotube, Void Form International, or equal. Forms shall be "WallVoid" for temporary support of concrete walls and grade beams spanning between supports, and "SlabVoid" for creating gaps between concrete slabs or steps and underlying soils. Void forms shall be fabricated of corrugated paper with moisture resistant exterior, and shall be capable of withstanding working load of 1,500 psf. Provide accessories as required.

PART 3 - EXECUTION

3.1 GENERAL

A. Forms shall be constructed so as to shape final concrete structure conforming to shape, lines and dimensions of members required by Drawings and Specifications, and shall be sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together to maintain position and shape. Forms and their supports shall be designed so that previously placed structures will not be damaged.

B. Use form coating at all surfaces in contact with concrete.

3.2 TOLERANCES

A. Permitted abrupt or gradual irregularities in formed surfaces as measured within a 5 feet length with a straightedge shall per ACI 347, Table 3.1:

Class of Surface			
A	B	C	D
1/8 inch	1/4 inch	1/2 inch	1 inch

1. Class A: Use for concrete surfaces prominently exposed to public view.
2. Class B: Use for coarse-textured concrete-formed surfaces intended to receive plaster, stucco or wainscoting.

3. Class C: Use as a general standard for permanently exposed surfaces where other finishes are not specified.

4. Class D: Use for surfaces where roughness is not objectionable and will be permanently concealed.

3.3 ERECTION

A. Plywood shall be installed with horizontal joints level, vertical joints plumb and with joints tight. Back joints by studs or solid blocking, and fill where necessary for smoothness. Reused plywood shall be thoroughly cleaned, damaged edges or surfaces repaired and both sides and edges oiled with colorless form oil. Nail plywood along edges, and to intermediate supports, with common wire nails spaced as necessary to maintain alignment and prevent warping.

B. Openings for Cleaning: Provide temporary openings

C. at points in formwork to facilitate cleaning and inspection. At base of walls and wide piers, bottom form board on one face for entire length shall be omitted until form has been cleaned and inspected.

D. Chamfers: Provide 3/4 inch by 3/4 inch chamfer strips for all exposed concrete corners and edges unless otherwise indicated.

E. Reglets and Rebates: As specified in Section 03 3000: Cast-In-Place Concrete.

3.4 REMOVAL OF FORMS

A. Forms shall not be removed until concrete has sufficiently hydrated to maintain its integrity and not be damaged by form removal operations. Unless noted otherwise and/or permitted by the Architect, columns and wall forms shall not be removed in less than five days, floor slabs in less than seven days, beams and girders in less than 15 days, pan forms for joists may be removed after three days, but joist centering shall not be removed until after 15 days, and ramp, landing, steps and floor slabs shall not be removed in less than seven days. Shoring shall not be removed until member has acquired sufficient strength to support its weight, load upon it, and added load of construction.

B. Compressive strength of in-place concrete shall be determined by testing field-cured specimens representative of concrete location or members, as specified in Section 03 3000: Cast-In-Place Concrete.

3.5 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.6 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete steel reinforcement.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 014523: Testing and Inspection.
3. Section 031000: Concrete Forming.
4. Section 033000: Cast-In-Place Concrete.

1.2 REGULATORY REQUIREMENTS

A. Fabrication and placement of reinforcing shall be in accordance with requirements of CBC, Chapter 19A.

1.3 REFERENCES

A. ASTM International:

1. ASTM A184 - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.
2. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
3. ASTM A706 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
4. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

B. American Concrete Institute (ACI) Publication:

1. ACI SP-66 – ACI Detailing Manual.
2. ACI 318 – Building Code Requirements for Structural Concrete, as modified by CBC.
3. ACI 117 – Specifications for Tolerance for Concrete Construction and Materials.

C. American Welding Society (AWS):

1. AWS D1.4 – Structural Welding Code – Reinforcing Steel.

D. Concrete Reinforcing Steel Institute (CRSI):

1. Manual of Standard Practice.

1.4 SUBMITTALS

A. Shop Drawings: Submit steel reinforcement Shop Drawings. Include assembly diagrams, schedule of reinforcement, stirrup spacing, bending charts and slab and framing plans. Indicate lengths and location of splices, laps of bars, size and lengths of reinforcing steel. Indicate steel type and grade of reinforcement. Indicate epoxy or non-epoxy reinforcement on general notes.

B. Closeout Submittals: Record exact locations of reinforcing that vary from Contract Documents.

C. Manufacturer's Mill Certificate: Submit, certifying that products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice.
2. American Welding Society (AWS).
3. American Concrete Institute (ACI).
4. CBC, Chapter 19A, Concrete.

B. Source Quality Control: Refer to Division 01 Sections for general requirements and to the following paragraphs for specific procedures. Testing laboratory retained by the OWNER shall select test Samples of bars, ties, and stirrups from the material at the Project Site or from the place of distribution, with each Sample consisting of not less than two 18 inch long pieces, and perform the following tests according to ASTM A615, or ASTM A706, as applicable:

1. Identified Bars: If Samples are obtained from bundles as delivered from the mill, identified as to heat number, accompanied by mill analyses and mill test reports, and properly tagged with the identification certificate so as to be readily identified, perform one tensile and one bend test for each 10 tons or fraction thereof of each size of bars. Submit mill reports when Samples are selected.
2. Unidentified Bars: When positive identification of reinforcing bars cannot be performed and when random Samples are obtained; perform tests for each 2.5 tons or fraction thereof, one tensile and one bend test from each size of bars.

C. Certification of Welders: Shop and Project site welding shall be performed by welding operators certified by AWS.

1.6 DELIVERY, STORAGE AND HANDLING

A. Avoid exposure to dirt, moisture or conditions harmful to reinforcing.

B. Reinforcing steel bars, wire, and wire fabric shall be stored on the Project site to permit easy access for examination and identification of each shipment. Material of each shipment shall be separated for size and shape.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide reinforcing of sizes, gages and lengths indicated, bent to indicated shapes.

2.2 MATERIALS

A. Steel Reinforcing Bars:

1. ASTM A615, deformed grade 60 or 75 billet steel, as indicated on the drawings.

2. Weldable reinforcing bars shall conform to ASTM A706.

B. Bars or Rod Mats: ASTM A184.

C. Welded Wire Fabric for Reinforcement: ASTM A1064.

D. Tie Wire: ASTM A1064, fully annealed, copper-bearing steel wire, 16 gage minimum.

E. Chairs, Spacers, Supports, and Other Accessories: Standard manufacture conforming to ACI 315 fabricated from steel wire of required types and sizes. For reinforcement supported from grade, provide properly sized dense precast blocks of concrete.

2.3 FABRICATION OF REINFORCING BARS

A. Comply with CRSI Manual of Standard Practice for Reinforced Concrete Construction for fabrication of reinforcing steel.

B. Bending and Forming: Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials. Do not heat reinforcement for bending. Bend bars No. 6 size and larger in the shop only. Bars with unscheduled kinks or bends are not permitted. Provide only tested and permitted bar materials.

C. Welding: Provide only ASTM A706 steel where welding is indicated. Perform welding by the direct electric arc process in accordance with AWS D1.4 and specified low-hydrogen electrodes. Preheat 6 inches each side of joint. Protect joints from drafts during the cooling process; accelerated cooling is not permitted. Do not tack weld bars. Clean metal surfaces to be welded of loose scale and foreign

material. Clean welds each time electrode is changed and chip burned edges before placing welds. When wire brushed, the completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration into the base metal. Cut out welds or parts of welds deemed defective, using chisel, and replace with proper welding. Prequalification of welds shall be in accordance with CBC requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Bars shall be bent cold. Bars partially embedded in concrete shall not be field bent except as indicated on reviewed Shop Drawings.

B. Before installation and just prior to placing concrete, clean reinforcing of loose scale, rust, oil, dirt and any coating that could reduce bond.

C. Accurately position, install, and secure reinforcing to prevent displacement during the placement of concrete.

D. Provide metal chairs to hold reinforcement the required distance above form bottoms. In beams and slab construction, provide chairs under top slab reinforcement as well as under bottom reinforcement. Space chairs so that reinforcement will not be displaced during installation. Provide metal spacers to secure proper spacing. Stirrups shall be accurately and securely wired to bars at both top and bottom. At slabs, footings, and beams in contact with earth, provide concrete blocks to support reinforcement at required distance above grade.

E. Install and secure reinforcement to maintain required clearance between parallel bars and between bars and forms. Lapped splices shall be installed wherever possible in a manner to provide required clearance between sets of bars. Stagger lapped splices. Dowels and bars extending through construction joints shall be secured in position against displacement before concrete is installed and subsequently cleaned of concrete encrustations while they are still soft.

F. Do not install reinforcing in supported slabs and beams until walls and columns have been installed to underside of slabs and beams or until construction joints have been thoroughly cleaned. Reinforcing shall be inspected before placement of concrete and cleaned as required.

G. Use deformed bars unless otherwise indicated, except for spiral reinforcement.

3.2 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.3 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place normal weight and lightweight concrete, placement and finishing.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 1000: Concrete Forming and Accessories.
3. Section 03 2000: Concrete Reinforcing.
4. Section 32 1313: Site Concrete Work.

1.2 REFERENCES

A. American Concrete Institute (ACI) Publication:

1. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 – Specifications for Structural Concrete.
3. ACI 302.1R – Guide for Concrete Floor and Slab Construction.
4. ACI 305R - Specification for Hot Weather Concreting.
5. ACI 306.1 – Standard Specification for Cold Weather Concreting.
6. ACI 308R – Guide to External Curing of Concrete.
7. ACI 318 - Building Code Requirements for Structural Concrete, as modified by CBC Sections 1903A and 1905A.

B. American Society for Testing and Materials (ASTM) Standards:

1. ASTM C31 – Standard Specification for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33 - Standard Specification for Concrete Aggregates.
3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

5. ASTM C88 - Standard Test Method for Soundness of Aggregates by use of Sodium Sulphate or Magnesium Sulphate.
6. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
7. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
8. ASTM C150 - Standard Specification for Portland Cement.
9. ASTM C156 – Standard Test Method for Water Loss (from a Mortar Specimen) Through Liquid Membrane-Forming Curing Compounds for Concrete.
10. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
11. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.
12. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
13. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
14. ASTM C289 - Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).
15. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
16. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
17. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
18. ASTM C567 - Standard Test Method for Determining Density of Structural Lightweight Concrete.
19. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
20. ASTM C845 - Standard Specification for Expansive Hydraulic Cement
21. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
22. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
23. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
24. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
25. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
26. ASTM C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

27. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.

28. ASTM C1567 - Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).

29. ASTM D1751 - Standard Test Method for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

30. ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

31. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

32. ASTM E1155 - Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.

33. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

34. ASTM E1745 - Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

35. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

36. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

37. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes.

38. ASTM F3010 – Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use under Resilient Floor Coverings.

1.3 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating locations of cast-in-place concrete Work and accessory items such as vapor barriers. Include details and locations of reinforcing, embedded items, and interfacing with other Work. Indicate dimensions and compressive strength.

B. Mix Design Data: Submit concrete mix designs as specified herein and in Article 2.02.

1. Submit name, address and telephone number of the concrete production facility which the contractor intends to engage to design the concrete mixes. Submit name and qualifications of the proposed concrete technologist.

2. Mix Design: Submit a concrete mix design for each strength and type of concrete indicated in the drawings or specified. Include water/cement ratio, source, size and amount of coarse aggregate and admixtures. Predict minimum

compressive strength, maximum slump and air content percentage. Clearly indicate locations where each mix design will be used.

a. Water/cement ration for concrete slabs on grade shall be 0.50 maximum.

3. Test Reports: Submit copies of test reports showing that the proposed mixes produce concrete with the strengths and properties specified. Include tests for cement, aggregates and admixtures. Provide gradation analysis.

C. Material Samples: Submit Samples illustrating concrete finishes and hardeners, minimum 12-inch by 12-inch.

D. Certificates: Submit certification that each of the following conforms to the standards indicated:

1. Portland cement: ASTM C150.

2. Normal weight concrete aggregates: ASTM C33.

3. Lightweight concrete aggregates: ASTM C330.

4. Aggregates: Submit evidence that the aggregate is not reactive in the presence of cement alkalis. In the absence of evidence, aggregate shall be tested by one of the methods in ASTM C33 Appendix XI, Methods for Evaluating Potential for Deleterious Expansion Due to Alkali Reactivity of an Aggregate. Aggregates deemed to be deleterious or potentially deleterious may be used with the addition of a material that has been shown to prevent harmful expansion in accordance with Appendix XI of ASTM C33, when approved by the building official, in accordance with ACI 318 Section 26.4.1.2

5. Curing materials: ASTM C171.

E. Admixtures: Submit product data for proposed concrete admixtures.

1.4 QUALITY ASSURANCE

A. Continuous inspection shall be provided at the batch plant and for transit-mixed concrete to run check sieve analysis of aggregate, check moisture content of fine aggregate, check design of mix, check cement being used with test reports, check loading of mixer trucks, and certify to quantities of materials placed in each mixer truck.

B. Inspection shall be performed by a representative of a testing laboratory selected by the OWNER. OWNER will pay for inspection costs. Notify the laboratory 24 hours in advance of time concrete is to be mixed. Notify the laboratory of postponement or cancellation of mixing within at least 24 hours of scheduling time.

C. CONTRACTOR shall assist the testing laboratory in obtaining and handling samples at the project site and at the source of materials.

D. Continuous batch plant inspection requirement may be waived in accordance with CBC Section 1705A.3.3.1. Waiver shall be in writing, including DSA approval. When batch plant inspection is waived by DSA, the following requirements shall be met:

1. Approved inspector of the testing laboratory shall check the first batching at the start of work and furnish mix proportions to the licensed weightmaster.
2. Licensed weightmaster shall positively identify materials as to quantity and certify to each load by a ticket.
3. Tickets shall be transmitted to the Inspector by a truck driver with load identified thereon. The Inspector will not accept the load without a load ticket identifying the mix and will keep a daily record of placements, identifying each truck, its load and time of receipt and approximate location of deposit in the structure and will transmit a copy of the daily record to DSA.
4. At the end of the project, the weightmaster shall furnish an affidavit to DSA certifying that all concrete furnished conforms in every particular to proportions established by mix designs.

E. Special Inspections and Tests shall be in accordance with CBC Chapter 17A, Reinforcement and Anchor testing per CBC Section 1903A and Specification Section 01 4523.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store cement and aggregate materials so as to prevent their deterioration or intrusion by foreign matter. Deteriorated or contaminated materials shall not be furnished.

B. Packaged materials shall bear the manufacturers and brand name label and shall be stored in their original unbroken package in a weather tight place until ready for use in the work.

1.6 PROJECT CONDITIONS

A. Cold Weather Requirements: Batching, mixing, delivering and placing of concrete in cold weather shall comply with the applicable requirements of ACI 306.1.

B. Hot Weather Requirements: Batching, mixing, delivering and placing of concrete in hot weather shall comply with the applicable requirements of ACI 305R.

C. Concrete temperature of freshly mixed concrete shall be determined per ASTM C1064.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cement: ASTM C150. Portland Cement.

B. Aggregates: Conform to the following standards:

1. Normal weight concrete: ASTM C33.
2. Aggregate shall be tested for Potential Alkali Reactivity of Cement-Aggregate Combinations per ASTM C289.

3. Nominal maximum size of coarse aggregate shall be no larger than:

   a. 1/5 the narrowest dimension between sides of forms, nor

   b. 1/3 the depth of slabs, nor

   c. 3/4 the clear spacing between individual reinforcing bars or wires, bundles of bars, individual tendons, or ducts.

   d. CONTRACTOR may request the ARCHITECT and DSA waiver of the above limitations reported per ACI 318, provided that the workability and methods of consolidation are such that the concrete can be placed without honeycombs or voids.

C. Water: Water for concrete mixes, curing and cleaning shall be potable and free from deleterious matter.

D. Admixtures: Shall be shown capable of maintaining essentially the same composition and performance throughout the work as the product used in establishing concrete proportions in accordance with ACI 318, Section 26.4.1.5.

1. Admixtures containing chlorides or sulfides are not permitted.

2. Air-entraining admixtures shall comply with ASTM C260. Air-entrained admixtures shall not be used for floor slabs to receive steel trowel finish.

3. Admixtures for water reduction and setting time modification shall conform to ASTM C494.

4. Admixtures for producing flowing concrete shall conform to ASTM C1017.

5. Admixtures containing ASTM C845 expansive cements shall be compatible with the cement and produce no deleterious effects.

6. Silica fumes used as an admixture shall conform to ASTM C1240.

E. Reinforcement Fibers: Chop strands of alkali-resistant polypropylene or nylon fibers added to the concrete mix for protection against shrinkage cracks.

F. Expansion Joint Fillers: Preformed strips, non-extruding and resilient bituminous type, of thickness indicated, conforming to ASTM D1751.

2.2 CONCRETE MIX

A. Mix shall be signed and sealed by a Civil or Structural Engineer currently registered in the State of California.

B. Strength of Concrete: Strengths and types of concretes shall be as indicated in the Drawings. Unless otherwise indicated or specified, concrete shall be provided with minimum 28-day strength of 3000 psi (f'c).

C. Concrete mix shall meet the durability requirements of ACI 318, Chapter 19.

D. Concrete proportioning shall be determined on the basis of field experience and/or trial mixtures shall in accordance with ACI 318, Section 26.4.3. Proportions of materials shall provide workability and consistency to permit concrete to be placed

readily into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding.

E. Ready-Mixed Concrete: Mix and deliver in accordance with requirements of ASTM C94.

PART 3 - EXECUTION

3.1 GENERAL

A. Surfaces to receive concrete shall be free of debris, standing water, and any other deleterious substances before start of concrete placing.

B. Time of Placing: Do not place concrete until reinforcement, conduits, outlet boxes, anchors, hangers, sleeves, bolts, and other embedded materials are securely fastened in place. Contact the Inspector at least 24 hours before placing concrete; do not place concrete until inspected by the Project Inspector.

C. Pouring Record: A record shall be kept on the Project site of time and date of placing concrete in each portion of structure. Such record shall be maintained on the Project site until Substantial Completion and shall be available for examination by the ARCHITECT and DSA.

3.2 PREPARATION

A. For installation of vapor barrier refer to Section 07 2600, Vapor Barriers.

B. Reglets and Rebates:

1. Form reglets and rebates in concrete to receive flashing, frames and other equipment as detailed and required. Coordinate dimensions and locations required with other related Work.

2. If concrete slabs on grade adjoin a wall or other perpendicular concrete surface, form a reglet in wall to receive and carry horizontal concrete Work. Reglet shall be full thickness of the slab and shall be 3/4 inch wide, unless otherwise indicated. Requirement does not apply to exterior walks, unless specifically indicated.

C. Screeds: Install screeds accurately and maintain at required grade or slab elevations after steel reinforcement has been installed, but before starting to place concrete. Install screeds adjacent to walls and in parallel rows not to exceed 8 feet on centers.

3.3 INSTALLATION

A. Conveying and Placing:

1. Concrete shall be placed only under direct observation of the Project Inspector. Do not place concrete outside of regular working hours, unless the Inspector has been notified at least 48 hours in advance.
2. Concrete shall be conveyed from mixer to location of final placement by methods that will prevent separation or loss of materials.
3. Concrete shall be placed as nearly as practicable to its final position to avoid segregation due to re-handling or flowing. No concrete that has partially hydrated or has been contaminated by foreign materials shall be placed, nor shall re-tempered concrete or concrete which has been remixed after initial set be placed.
4. In placing concrete in columns, walls or thin sections, provide openings in forms, elephant trunks, tremies or other recognized devices, to prevent segregation and accumulation of partially hydrated concrete on forms or metal reinforcement above level of concrete being placed. Such devices shall be installed so that concrete will be dropped vertically. Unconfined vertical drop of concrete from end of such devices to final placement surface shall not exceed 6 feet.
5. Concrete shall be placed as a continuous operation until placing of panel or section is completed. Top surfaces of vertically formed lifts shall be level.
6. Concrete shall be thoroughly consolidated by suitable means during placement and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.
7. Where conditions make consolidation difficult or where reinforcement is congested, batches of mortar containing same proportions of cement, sand, and water as provided in the concrete, shall first be deposited in the forms to a depth of at least one inch.

B. Cold Weather:

1. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather. All ground with which concrete is to come in contact shall be free from frost. No frozen materials or materials containing ice shall be used.
2. The temperature of concrete at the time of placement shall not be below the minimum temperatures given in Table 3.1 of ACI 306.1.
3. Concrete shall be maintained at a temperature of at least 50° F. for not less than 72 hours after placing or until it has thoroughly hardened. Cover concrete and provide sufficient heat as required. When necessary, aggregates shall be heated before mixing. Special precautions shall be taken for protection of transit-mixed concrete.

C. Hot Weather:

1. Concrete to be placed during hot weather shall comply with the requirements of ACI 318, Section 26.5.5.

2. Maintain concrete temperatures indicated in Table 2.1.5 of ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square feet of exposed concrete per hour.

3. Cool concrete using methods indicated in ACI 305R Appendix B.

4. Place and cure concrete as specified in ACI 305R Chapter 4.

D. Compaction and Screeding:

1. Tamp freshly placed concrete with a heavy tamper until at least 3/8 inch of mortar is brought to surface. Concrete shall then be tamped with a light tamper and screeded with a heavy straightedge until depressions and irregularities are eliminated, and surface is true to finish grades or elevations. Remove excess water and debris.

2. Where slabs are to receive separate cement finish or mortar setting bed, continued tamping to raise mortar to surface is not performed. Laitance shall be removed by brushing with a stiff brush or by light sandblasting to expose clean top surface of coarse aggregate.

E. Floating and Troweling:

1. When concrete has hydrated sufficiently, it shall be floated to a compact and smooth surface. After floating, wait until concrete has reached proper consistency before troweling. Top surfaces shall receive at least 2 troweling operations with steel hand trowel. Prior to and during final troweling, apply a fine mist of water frequently with an atomizing type fog sprayer. Omit troweling for slabs to receive a separate cement finish.

2. Vertical concrete surfaces shall be finished smooth and free from marks or other surface defects.

3.4 CURING

A. Length of time, temperature and moisture conditions for curing concrete shall be in accordance with ACI 318, Section 26.5.3.

B. Forms containing concrete, top of concrete between forms, and exposed concrete surfaces after removal of forms shall be maintained in a thoroughly wet condition for at least 7 consecutive days after placing.

C. If weather is hot or surface has dried out, spray surface of concrete slabs and paving with fine mist of water, starting not later than 2 hours after final troweling and continuing until sunset. Surface of finish shall be kept continuously wet until curing medium has been installed.

D. Immediately after finishing, monolithic floor slabs shall be covered with curing paper. Paper shall be lapped 4 inches at joints and sealed with waterproof sealer. Edges shall be cemented to finish. Repair or replace paper damaged during construction operations.

E. When curing slabs with proactive water vapor emission and alkalinity control system:

1. Coordinate and schedule application of curing compound with concrete pour schedule, while conforming to manufacturer's application instructions.
2. When the surface of the concrete has hardened sufficiently to sustain foot traffic pre-cure slabs with liquefied product application following manufacturer's written instructions. Application shall be by trained applicators.
3. Monitor Environmental Conditions: Set up weather station 20 to 30 inches above freshly placed concrete. Record temperature, humidity and wind velocity measurements at 15-minute maximum intervals.
4. Calculate Evaporation Rate: Use recorded weather information in combination with nomograph per ACI 308R, Figure 4.1, Guide to Curing Concrete, to evaluate relevant evaporation rate.
5. When the bleed water rate of the concrete is approximately equal to the surface water evaporation rate, spray curing compound material throughout surface of slabs and decks, following manufacturer's written instructions. Application shall be by trained applicators.
6. Perform the following tests at least 28 days after placement of concrete and prior to floor covering installation. Submit to OAR test results indicating locations that do not comply with scheduled flooring installation requirements.
    a. Calcium chloride testing per ASTM F1869.
    b. Relative humidity testing per ASTM F2170.
    c. Alkalinity testing per ASTM F710.
    d. Perform concrete bond layer humidity meter testing to determine substrate surface acceptability.

3.5 FILLING, LEVELING AND PATCHING

A. Concrete slabs exhibiting high or low spots and indicated to receive resilient floor covering or soft floor covering, shall have surfaces repaired. High spots shall be honed, or ground with power-driven machines to required tolerances. Low spots shall be filled with latex underlayment, installed in strict accordance with manufacturer's written recommendations.

B. Holes resulting from form ties or sleeve nuts shall be solidly packed, through exterior walls, by pressure grouting with cement grout, as specified. Grouted holes on exposed surfaces shall be screeded flush and finished to match adjoining surfaces.

C. Cement Base: Cement base shall be of the height, thickness, and shape detailed. Base shall be reinforced with one inch mesh, 18 gage, zinc-coated wire fabric. Base finish mixture shall be one part Portland cement, 2 parts of fine aggregate and one part pea gravel. Colored cement base shall include a chemically inert mineral oxide pigment in the mix.

3.6 FINISHING

A. Broom Finish: Exterior concrete shall be provided with a non-slip broom finish in addition to abrasive finish specified.

3.7 EXPANSION AND CONSTRUCTION JOINTS

A. Construction Joints: Details and proposed location of construction joints shall be as indicated on the Drawings, located to least impair strength of structure, in accordance with the following:

1. Thoroughly clean contact surface by sand blasting entire surface not earlier than 5 days after initial placement.

2. A mix containing same proportion of sand and cement provided in concrete plus a maximum of 50 percent of coarse aggregate shall be placed to a depth of at least one inch on horizontal joints. Vertical joints shall be wetted and coated with a neat cement grout immediately before placing of new concrete.

3. Should contact surface become coated with earth, sawdust, or deleterious material of any kind after being cleaned, entire surface shall be re-cleaned before applying mix.

B. Expansion Joints: Provide expansion joints where indicated in walks and exterior slabs. Space approximately 12 feet apart, unless otherwise indicated. Joints shall extend entirely through slab with joint filler in one piece for width of walk or slab. Joint filler shall be 3/8 inch thick, unless otherwise indicated.

C. Tooled Joints: Slabs, walks and paving shall be marked into areas as indicated with markings made with a V-grooving tool. Marks shall be round-edged, free from burrs or obstructions, with clean cut angles and shall be straight and true. Walks, if not indicated, shall be marked off into rectangles of not more than 12 square feet and shall have a center marking where more than 5 feet wide.

3.8 TESTING

A. Molded Cylinder Tests:

1. Inspector or testing lab personnel will prepare cylinders and perform slump tests. Samples for concrete strength shall be taken in accordance with ASTM C172. Each cylinder shall be dated, given a number, point in structure from which sample was obtained, mix design number, mix design strength and result of accompanying slump test noted.

2. Separate tests of molded concrete cylinders obtained at same place and time shall be made at age of three days, seven days, and 28 days. A strength test shall be the average of the compressive strength of two cylinders, obtained from the same sample of concrete and tested at 28 days or at test age designated for determination of f'c.

3. Test cylinders shall be prepared at the Project site and stored in testing laboratory in accordance with ASTM C31, and tested in accordance with ASTM C39.

B. Core Test: At request of the ARCHITECT, cores of hardened concrete shall be cut from portions of hydrated structures for testing, in accordance with CBC and ASTM C42.

1. Provide 4-inch diameter cores at representative places throughout the structure as designated by the ARCHITECT.

2. In general, provide sufficient cores to represent concrete placed with at least one core for each 4,000 square feet of building area, and at least 3 cores total for each Project.

3. Where cores have been removed, fill voids with drypack, and patch the finish to match the adjacent existing surfaces.

C. Concrete Consistency: Measure consistency according to ASTM C143. Test twice each day or partial day's run of the mixer.

D. Adjustment of Mix: If the strength of any grade of concrete for any portion of Work, as indicated by molded test cylinders, falls below minimum 28 days compressive strength specified or indicated, adjust mix design for remaining portion of construction so that resulting concrete meets minimum strength requirements.

E. Air Content Testing: Measure in accordance with ASTM C173 or ASTM C231, for each composite sample taken in accordance to ASTM C172.

F. Defective Concrete:

1. Should strength of any grade of concrete, for any portion of Work indicated by tests of molded cylinders and core tests, fall below minimum 28 days strength specified or indicated, concrete will be deemed defective Work and shall be replaced or adequately strengthened in a manner acceptable to the ARCHITECT and DSA.

2. Concrete Work that is not formed as indicated, is not true within 1/250 of span, not true to intended alignment, not plumb or level where so intended, not true to intended grades and levels, contains sawdust shavings, wood or embedded debris, or does not fully conform to Contract provisions, shall be deemed to be defective Work and shall be removed and replaced.

G. Concrete for Equipment Pads, Mechanical and Electrical Work: Unless otherwise indicated, strength shall have a minimum $f'c$ = 3,000 psi. Exposed concrete shall be provided with a hand trowel finish with radius corners and edges. Form and place concrete where necessary as described in Section 03 1000 Concrete Forming and Accessories and reinforced as described in Section 03 2000 Concrete Reinforcing. Calcium chloride shall not be furnished in any concrete mix provided for the installation of underground electrical conduits. For concrete encasement of more than one conduit, furnish 3/4-inch maximum aggregate.

3.9 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.10 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION 033000

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

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. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. FMC: Flexible metal conduit.

E. IMC: Intermediate metal conduit.

F. LFMC: Liquidtight flexible metal conduit.

G. NBR: Acrylonitrile-butadiene rubber.

H. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
   1. Custom enclosures and cabinets.
   2. For handholes and boxes for underground wiring, including the following:
      a. Duct entry provisions, including locations and duct sizes.
      b. Frame and cover design.
      c. Grounding details.
      d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
      e. Joint details.

C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Structural members in the paths of conduit groups with common supports.
   2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.

D. Manufacturer Seismic Qualification Certification: Submit certification that enclosures and cabinets and their mounting provisions, including those for internal components, will withstand seismic forces. Include the following:
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
      a. The term "withstand" means "the cabinet or enclosure will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will retain its enclosure characteristics, including its interior accessibility, after the seismic event."
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Qualification Data: For professional engineer and testing agency.

F. Source quality-control test reports.

1.5 QUALITY ASSURANCE

A. 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.

B. Comply with CEC.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. AFC Cable Systems, Inc.
   2. Alflex Inc.
   3. Allied Tube & Conduit; a Tyco International Ltd. Co.
   4. Anamet Electrical, Inc.; Anaconda Metal Hose.
   5. Electri-Flex Co.
   6. Manhattan/CDT/Cole-Flex.
   7. Maverick Tube Corporation.
   8. O-Z Gedney; a unit of General Signal.
   9. Wheatland Tube Company.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

F. EMT: ANSI C80.3.

G. FMC: Zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket.

I. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel, compression type.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

J. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Type EPC-40-PVC**,** unless otherwise indicated.

D. LFNC: UL 1660.

E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: UL 514B.

2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Arnco Corporation.
2. Endot Industries Inc.
3. IPEX Inc.
4. Lamson & Sessions; Carlon Electrical Products.

B. Description: Comply with UL 2024; flexible type, approved for plenum and general-use installation.

2.4 METAL WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, 12 or 3R, unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type, Screw-cover type or Flanged-and-gasketed type.

E. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Hoffman.
2. Lamson & Sessions; Carlon Electrical Products.

B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.

C. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.6 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Thomas & Betts Corporation.
      b. Walker Systems, Inc.; Wiremold Company (The).
      c. Wiremold Company (The); Electrical Sales Division.

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Butler Manufacturing Company; Walker Division.
      b. Enduro Systems, Inc.; Composite Products Division.
      c. Hubbell Incorporated; Wiring Device-Kellems Division.
      d. Lamson & Sessions; Carlon Electrical Products.
      e. Panduit Corp.
      f. Walker Systems, Inc.; Wiremold Company (The).
      g. Wiremold Company (The); Electrical Sales Division.

2.7 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
   2. EGS/Appleton Electric.
   3. Erickson Electrical Equipment Company.
   4. Hoffman.
   5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
   6. O-Z/Gedney; a unit of General Signal.
   7. RACO; a Hubbell Company.
   8. Robroy Industries, Inc.; Enclosure Division.
   9. Scott Fetzer Co.; Adalet Division.
   10. Spring City Electrical Manufacturing Company.
   11. Thomas & Betts Corporation.
   12. Walker Systems, Inc.; Wiremold Company (The).
   13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Metal Floor Boxes: Cast or sheet metal, fully adjustable, rectangular.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.

G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic

H. Cabinets:
1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.8 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Comply with SCTE 77.
1. Color of Frame and Cover: Gray.
2. Configuration: Units shall be designed for flush burial and have open or closed bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC.", "TELEPHONE." as indicated for each service.
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7. Handholes as indictated and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Armorcast Products Company.
b. Carson Industries LLC.
c. CDR Systems Corporation.

d. NewBasis.

2.9 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

2.10 SLEEVE SEALS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Plastic or Carbon steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.11 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
1. Tests of materials shall be performed by a independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
   1. Exposed Conduit: Rigid steel conduit, IMC.
   2. Concealed Conduit, Aboveground: Rigid steel conduit, IMC or EMT.
   3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R, Stainless Steel.
   6. Application of Handholes and Boxes for Underground Wiring:
      a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
      b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
      c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.

B. Comply with the following indoor applications, unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed, Not Subject to Severe Physical Damage: EMT.
   3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
      a. Loading dock.
      b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      c. Mechanical rooms.
   4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
   6. Damp or Wet Locations: Rigid steel conduit or IMC.
   7. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical fiber/communications cable raceway EMT.
   8. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: General-use, optical fiber/communications cable raceway Plenum-type, optical fiber/communications cable raceway EMT.
   9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel or nonmetallic in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:
1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Change from ENT to PVC coded, rigid steel conduit, or IMC before rising above the floor.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
   1. 3/4-Inch (19-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).
   2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
   3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where otherwise required by CEC.

N. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m).
   1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
      a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
      b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
      c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
      d. Attics: 135 deg F (75 deg C) temperature change.
   2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.
   3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

O. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
   1. Use LFMC in damp or wet locations subject to severe physical damage.
   2. Use LFMC in damp or wet locations not subject to severe physical damage.

P. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

Q. Set metal floor boxes level and flush with finished floor surface.

R. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
   1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
   2. Install backfill as specified in Division 31 Section "Earth Moving."
   3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
   4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
   5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
      a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
      b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
   6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install handholes and boxes with bottom below the frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

C. Rectangular Sleeve Minimum Metal Thickness:
   1. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
   2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway unless sleeve seal is to be installed or unless seismic criteria require different clearance.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials.

K. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.8 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Protecting existing trees, shrubs, groundcovers, plants, and grass to remain.
2. Removing existing trees, shrubs, groundcovers, plants, and grass.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting and capping or sealing site utilities.
7. Temporary erosion and sedimentation control measures.

1.2 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site-clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

3.4 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

3.5 CLEARING AND GRUBBING

A. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

B. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

3.8 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 31 10 00

SECTION 31 20 00 – EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for walks, pavements, lawns and grasses.
2. Drainage course for slabs-on-grade.
3. Base course for concrete walks and pavements.
4. Base course for asphalt paving.
5. Excavating and backfilling for utility trenches.

1.2 QUALITY ASSURANCE

Standard Specifications: Comply with the Standard Specifications for Public Works Construction (SSPWC), latest edition and supplements for rock materials. The Standard Specifications apply only to performance and materials and how they are to be incorporated into the Work. The legal/contractual relationship sections and the measurement and payment sections do not apply to this document.

1.3 REFERENCES

This specification section has been prepared using the Standard Specifications for Public Works Construction (SSPWC), latest edition for reference.

1.4 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Course placed between the subgrade and hot-mix asphalt or concrete paving.

C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Classified Excavation: Removal and disposal of materials not defined as rock

F. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

G. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

H. Fill: Soil materials used to raise existing grades.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below base, drainage fill, or topsoil materials.

K. Unclassified Excavation: Removal and disposal of materials encountered regardless of nature of materials, including rock.

L. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Sand, gravel, friable earth, or non-expansive clays, subject to Testing Laboratory's approval. Fill and backfill material shall be free of organic material, slag, cinders, expansive soils, trash or rubble and stones having maximum dimension greater than 4 inches.

C. Unsatisfactory Soils: Expansive and other soils as defined in the project's geotechnical investigation report.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Pavement Base Course: Material conforming to SSPWC section 200-2.2, Crushed Aggregate Base or SSPWC section 200-2.4 Crushed Miscellaneous Base.

E. Synthetic Turf Field Base Course: Material conforming to Caltrans Standard Specifications, Caltrans Class II Permeable Material or equivalent.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded clean, crushed sand; ASTM D 2940; except with 100 percent passing a 3/8-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washed, crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility. Color coding shall be according to the American Public Works Association (APWA) standards:

1. Blue – Potable water and fire suppression lines.
2. Green – Sanitary sewer and storm drain lines
3. Orange – Communication, alarm or signal lines
4. Purple – Reclaimed water, irrigation, and slurry lines
5. Red – Electrical power lines, cables, conduit and lighting lines
6. Yellow – Gas, oil, steam, petroleum, or gaseous material lines.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 2 Section "Site Clearing" or “Demolition”.

C. Protect and maintain erosion and sedimentation controls, which are specified in Division 2 Section "Site Clearing" or “Demolition,” during earthwork operations.

3.2 EXCAVATION

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide 6 inch clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course.

3.6 SUBGRADE INSPECTION

A. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Provide blanket protection for all utility pipes and conduits under driveways, roadways, parking lots, and other vehicular path of travel per APWA Standard Plan 225-1 where the minimum cover over the pipes and conduits is less than 36”.

D. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

E. Place and compact final backfill of satisfactory soil to final subgrade elevation.

F. Install warning tape directly above utilities, minimum 6 inches above top of pipe, minimum 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use engineered fill.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

3.11 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
   1. Under walkways, scarify and recompact top 12 inches below subgrade and compact each layer of backfill or fill soil material to 90 percent.
   2. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material to 85 percent.
   3. For utility trenches, compact each layer of initial and final backfill soil material to 85 percent.

3.13 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

   1. Lawn or Unpaved Areas: Plus or minus 1 inch.
   2. Walks: Plus or minus 1 inch.
   3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.14 BASE COURSES

A. Place base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place base course under pavements and walks as follows:

   1. Shape base course to required crown elevations and cross-slope grades.
   2. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.15 DRAINAGE COURSE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

   1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

2. Compact each layer of drainage course to required cross sections and thicknesses to not less than **95** percent of maximum dry unit weight according to ASTM D 698.

3.16 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 20 00

SECTION 320190 - OPERATION AND MAINTENANCE OF PLANTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Furnish all labor, material, equipment, and services required to maintain the landscape in an attractive condition as specified herein.

B. Related Work Specified in Other Sections:

1. Section 328413 – Planting Irrigation.
2. Section 329000 – Planting.

1.2 SUBMITTALS

A. Comply with provisions of Section 013300.

B. Product data: For each type of product indicated.

C. Product Certificates: For soil amendments and fertilizers, from manufacturer.

D. The CONTRACTOR 's representatives and employees shall be experienced in landscape maintenance.

1.3 MAINTENANCE PERIOD DURING PROGRESS OF WORK

A. The CONTRACTOR shall continuously maintain all areas involved in this Contract during the progress of work. Maintenance period shall not start until all elements of construction, planting, and irrigation for the entire project are in accordance with Plans and specifications.

1. All lawn and groundcover areas shall have been planted and all lawn areas shall show an even, healthy stand of grass seedlings or sod, either of which shall have been mowed twice. Maintenance period will not be shortened when this requirement is met but may be lengthened if not met.
2. The CONTRACTOR’s maintenance period will be extended if the provisions required within the Plans and specifications are not fulfilled. Project may not be segmented into maintenance phases.
3. The CONTRACTOR shall request a Substantial Completion inspection by the OAR and ARCHITECT at the completion of the installation process.
4. The Maintenance Period shall begin upon completion of the Substantial Completion walk-through punch list and acceptance of the landscape installation by the OAR.
5. If such criteria are met to the satisfaction of the OAR and ARCHITECT, a Substantial Completion Acceptance notification will be issued to the CONTRACTOR to establish the effective beginning date of the maintenance period.

B. The CONTRACTOR 's Maintenance Period continues for 90 calendar days until final acceptance of the work by the OAR and ARCHITECT. Improper maintenance or poor

condition of planting at the termination of the scheduled maintenance period may cause postponement of the final completion date of the Contract.

C. If the CONTRACTOR fails to adequately maintain planting, replace unsuitable plants or do weed control or other work, indicated in the Contract Documents, the OAR, will not be credited as one of the maintenance periods working days.

1.4 PLANT WARRANTY

A. Plant Warranty:

1. The CONTRACTOR agrees to replace defective work and defective plants. The OAR shall make the final determination if plants meet these specifications or that plants are defective.

2. Plant Warranty shall begin on the date of Substantial Completion Acceptance and continue for one (1) year for trees, and 90 days for shrubs, grasses, etc.

3. Plants shall be warrantied to meet the requirements for plant quality at installation in this Section. Defective plants shall be defined as plants not meeting these requirements. The OAR makes the final determination that plants are defective.

4. Plants determined to be defective shall be removed immediately upon notification by the OAR and replaced without cost to the OWNER as soon as weather conditions permit and within the specified planting period.

5. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this specification. Make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the OWNER.

6. The warranty of replacement plants shall extend for an additional 30 days from the date of their acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of the said extended warranty period, the OAR may elect one more replacement items or credit for each item. These tertiary replacement items are not protected under a warranty period.

7. During and by the end of the warranty period, remove all tree wrap, ties, and guying unless agreed to by the OAR to remain in place. trees that do not have sufficient caliper to remain upright, or those requiring additional anchorage in windy locations, shall be staked or remain staked, if required by the OAR.

1.5 END OF WARRANTY FINAL ACCEPTANCE

A. At the end of the warranty period, the shall observe all warranted work, upon written request of the CONTRACTOR. The request shall be received at least 72 hours before the anticipated date for final observation.

B. End of Warranty Final Acceptance will be given only when all the requirements of the work under this specification and in specification sections Planting Soil and Irrigation have been met.

1.6 OBSERVATION VISITS

A. The CONTRACTOR shall request progress visits from the ARCHITECT at least 72 hours in advance of anticipated visits. Normal observation visits are as follows:

1. Immediately prior to the commencement of the work in this section.

2. Completion of first 90 days ofmaintenance.

3. Final acceptance.

B. Prior to the date of the final observation visit, the CONTRACTOR shall acquire from the ARCHITECT-approved reproducible Plans and record (from the job record set) all changes made during construction, label these Plans "Record Drawings", and deliver to the ARCHITECT for review and approval.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials used shall either conform to landscape specifications in other sections or shall otherwise be acceptable to the OAR.

B. The OAR shall be given a monthly record of all insecticides, and disease control chemicals used. Failure to provide such a record will continue maintenance period until compliance occurs.

C. Work Specified in this Section: Furnish all labor, material, equipment, and services required to maintain the landscape in an attractive condition as specified herein for a period of 90 calendar days.

D. Related Work Specified in Other Sections:

1. Section 32 8400 - Planting Irrigation

2. Section 32 9000 - Planting

PART 3 - EXECUTION

3.1 MAINTENANCE

A. Maintenance shall be performed according to the following standards:

1. All areas shall be weeded and cultivated at intervals of not more than seven (7) days.

2. Watering, mowing, rolling, edging, trimming, fertilization, spraying, and pest and rodent control, as may be required, shall be included in the maintenance period.

3. The CONTRACTOR shall be responsible for maintaining adequate protection of the area. Damaged areas shall be repaired at the CONTRACTOR 's expense.

4. The CONTRACTOR shall reseed and re-sod all spots or areas within the lawn where normal turf growth is not evident.

B. The CONTRACTOR shall be responsible for reporting to the OAR conditions beyond his control that prevent or have negative impact on the work required herein.

3.2 TREE AND SHRUB CARE

A. Watering:

1. Apply enough irrigation water so that moisture penetrates throughout root zone and only as frequently as necessary to maintain healthy growth.

2. Do not maintain soils in a constantly wet condition.

3. CONTRACTOR shall be responsible for familiarizing himself with the particular water requirements for the various plantings and shall be responsible for setting and maintaining the automatic controller to optimum minimum levels.

a. Damage to the plantings caused by over-watering or under- watering shall be the responsibility of the CONTRACTOR r to replace at no cost to OWNER.

4. Maintain a water basin around newly planted plants so that water can be applied to moisturize throughout the root zone. At the end of the maintenance period these basins shall be flattened out to match surrounding grades.

5. If hand-watering, use a fan spray nozzle to break the water force.

B. Tree Pruning:

1. Nursery grown trees will not normally require pruning for the first year. Prune trees only if directed by ARCHITECT or OAR, and only for these purposes:

a. Selection and development of permanent scaffold branches that have a vertical spacing of from 18" to 48" and radial orientation so as not to cross each other.

b. Elimination of diseased or damaged growth.

c. Elimination of narrow V-shaped branch forks that lack strength.

d. Reduction of toppling and wind damage by thinning out crowns.

e. Maintenance of growth within space limitations.

f. Maintenance of natural appearance.

g. Balancing of crown-to-root ratio.

C. Shrub Pruning:

1. The objectives of shrub pruning are the same as for trees. Shrubs shall not be clipped into balled or boxed forms unless such is directed by the ARCHITECT or OAR.

2. Plant pruning: Remove cross over branching, shorten or remove developing co dominant leaders, dead wood and winter-damaged branches. Unless directed by the ARCHITECT or OAR, do not shear plants or make heading cuts.

3. All pruning cuts shall be made to lateral branches or buds or flush with the trunk. "Stubbing" will not be permitted.

D. Staking and Guying: Stakes and guys shall remain in place and are to be continuously inspected and adjusted to prevent girdling of trunks or branches and to prevent rubbing that causes bark wounds and to allow trees to sway freely.

E. Restore plants: Reset any plants that have settled or are leaning as soon as

F. the condition is noticed.

G. Weed Control: Keep all areas, including basins and areas between plants, free of weeds.

1. Remove weeds manually or mechanically. Herbicides are not to be used.

2. Avoid frequent soil cultivation next to trees or shrubs that destroys shallow roots.

3. Replenish mulches as needed to help prevent weed seed germination.

H. Pest Management Method and Products:

1. CONTRACTOR shall ensure that plants provided are clean, healthy, free of physical damage, and show no symptoms of abiotic injury. Plants must also be free of diseases, arthropod pests, and any other type of plant pests. Before applying pesticides to plants on OWNER property, the following criteria must be met:

a. Individuals who apply pesticides on behalf of CONTRACTOR's company must have a Qualified Applicator License in appropriate category of pest control issued by California Department of Pesticide Regulation and registered to conduct pest control for hire as a business by Los Angeles County Agricultural Commissioner's Office.

b. Products used must be listed on OWNER's approved product list.

c. Length of time from date of use of a pesticide products until beneficial occupancy by OAR may not be less than five half lives of products used.

d. Contact OWNER's Pest Management Department at (213) 743-1102 prior to any pesticide application to verify items above.

e. Complete written records of pesticide applications made by the CONTRACTOR and or their representative on OWNER property, must be provided to OWNER's Pest Management Department within 10 days of applications.

I. Fertilization:

1. Fertilize all planting areas at 30-day intervals after sod and plant installation.

a. Apply an all-purpose 15-15-15 commercial fertilizer at rate of 10 pounds per 1,000 square feet of installed area. Thoroughly water area after applying fertilizer. Fertilizer applications shall be performed under observation of Project Inspector.

b. Avoid applying fertilizer to root balls and bases of main stems

c. Spread fertilizer evenly around plants to drip line.

d. Distribute fertilizer evenly over turf or groundcover areas to avoid patchy coloration.

J. Replacement of Plants: Replace dead, dying, and missing plants with plants of a size, condition, and variety acceptable to ARCHITECT or OAR at CONTRACTOR's expense.

3.3 GROUND COVER CARE

A. Weed Control: Control weeds preferably manually or with mechanical methods only. Hoe weeds as little as possible since this may result in plant damage. Foot traffic in planted areas shall be minimized, and soil compaction shall be loosened immediately.

B. Watering: Water enough so that moisture penetrates throughout root zone and only as frequently as necessary to maintain healthy growth.

1. Do not maintain soils in a constantly wet condition.

2. CONTRACTOR shall familiarize himself with the particular water requirements for the planting and shall be responsible for setting and maintaining the automatic controller to optimum minimum levels.

3. Damage to the planting caused by over-watering or under-watering shall be the responsibility of the CONTRACTOR to replace.

C. Trash: Remove trash weekly. Remove debris, clippings or branches produced by maintenance activities within 8 hours.

D. Edging and Trimming: Edge ground cover to keep in bounds and trim top growth as necessary to achieve an overall even appearance.

E. Replacement: Replace dead and missing plants at CONTRACTOR 's expense.

3.4 LAWN AND TURF CARE

A. Mowing and Edging:

1. Perform first mowing of grass areas when grass is 2 1/2 inches high and repeat as often as is necessary to maintain sod at a height of 2 inches. In no case shall sod be cut lower then 1 1/2 inches in height unless otherwise directed.

2. Turf must be well-established and free of bare spots and weeds to the satisfaction of the ARCHITECT and OAR prior to final acceptance.

3. Edges shall be trimmed at least weekly or as needed for neat appearance.

4. Grass clippings shall be removed and legally disposed of off Project site.

B. Watering: Lawns shall be watered at such frequency as weather conditions require to replenish soil moisture below root zone and maintain healthy growth.

C. Fertilizing:

1. Apply fertilizer after initial mowing and when grass is dry. Fertilize all on-grade lawn areas as follows or as recommended by soils report:

a. At the end of the first 30 calendar days and at 30 to 90 calendar day intervals thereafter. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to turf area.

b. After application, irrigate thoroughly.

D. Weed Control: Remove broad leaf weeds manually or mechanically with selective herbicides. Turf areas shall be kept weed-free.

3.5 IRRIGATION SYSTEM

A. System Inspection: CONTRACTOR shall continuously check all systems for proper operation. Lateral lines shall be flushed out after removing the last sprinkler head or two at each of the lateral. All heads are to be continuously adjusted as necessary for proper coverage and to eliminate over-spray on buildings or paving. CONTRACTOR’s regular maintenance personnel shall test, observe, and adjust each sprinkler system no less than once per month.

B. Controllers: Set and program automatic controllers for seasonal water requirements and minimum optimum water use. Give OAR a key to controllers and instructions on how to turn off system in case of emergency.

C. Repairs: Repair all damage to irrigation system at CONTRACTOR 's expense. Repairs shall be made within one watering period.

END OF SECTION 320190

SECTION 32 12 16 - HOT-MIX ASPHALT (HMA) PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes hot-mix asphalt paving.

B. Traffic Stripes and Pavement Marking.
   1. traffic stripe: A longitudinal centerline or a longitudinal lane line used for separating traffic lanes in the same direction of travel or in the opposing direction of travel or a longitudinal edge line marking the edge of the traveled way or the edge of a lane at a gore area separating traffic at an exit or entrance ramp. A traffic stripe is a traffic line as shown.
   2. Pavement marking: A transverse marking such as (1) a limit line, (2) a stop line; or (3) a word, symbol, shoulder, parking stall, or railroad grade crossing marking.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

C. Material certificates.

D. Log of placement of asphalt, including dates, times, temperature readings and other pertinent information.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be registered with and approved by authorities having jurisdiction or the DOT of the state in which Project is located.

B. Standard Specifications: Comply with the Standard Specifications for Public Works Construction (SSPWC) and the California Department of Transportation (Caltrans), latest editions and supplements for asphalt paving work. These Specifications apply only to performance and materials and how they are to be incorporated into the Work. The legal/contractual relationship sections and the measurement and payment sections do not apply to this document.

C. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the atmospheric temperature is at least 50 deg F and rising at time of placement or during unsuitable weather.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at an ambient or surface temperature range recommended by the paint manufacturer.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. Coarse Aggregate (Type III Asphalt Concrete Mixture): Conforming to SSPWC 203-6.2.3.

B. Fine Aggregate (Type III Asphalt Concrete Mixture): Conforming to SSPWC 203-6.2.3.

C. Mineral Filler: Conforming to SSPWC 203-6.2.4.

2.2 ASPHALT CONCRETE MIXTURE

A. Composition and Grading: Conforming to SSPWC Sections 203-1 and 203-6.5.

2.3 ASPHALT MATERIALS

A. Asphalt Binder: Paving asphalt, conforming to SSPWC 203-1.2 and asphalt concrete curb shall be PG 70-10 according to SSPWC 203-6.2.1.

B. Tack Coat: PG 64-10 conforming to SSPWC 302-5.2.3.

C. Mixes: Hot-Mix Asphalt (HMA):

Wearing Course: Dense, hot-laid, hot-mix asphalt plant mix III-C3, PG 64-10 designed in conformance with SSPWC Section 203.

Base Course: Dense, hot laid, hot-mix asphalt plant mix III-B2, PG 64-10 designed in conformance with SSPWC Section 203.

D. Fog Seal: CSS-1 conforming to SSPWC 203-3.

2.4 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

B. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with Caltrans Standard Specifications - Section 84 (Federal Specification No. TT-P-

1952E for Blue, Red and Green paint; and State of California Standard Specification No. PTWB-01R2 for White, Yellow and Black paint) with drying time of less than 45 minutes.

1. Color: White, Yellow, and Blue as indicated on the plans.

PART 3 - EXECUTION

3.1 ASPHALT CONCRETE AND ASPHALT CONCRETE PAVEMENT

A. All work shall be in conformance with SSPWC Sections 203-6 and 302-5.

3.2 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Tack coat shall be uniformly applied by a distributor truck at a minimum rate of SS-1h emulsified asphalt in conformance to SSWC Table 302-5.8(A) or the application rate to achieve the minimum residual rate in conformance to SSWC Table 302-5.8(B), whichever is greater. For PG 64-10 paving asphalt, the application rate shall be a minimum of the residual rate in conformance to SSWC Table 302-5.8(B).

C. Patching: Fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.

3.3 SURFACE PREPARATION

A. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

B. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

C. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 gallon per square yard.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3. Asphalt binder tack coat temperature must be in the range of 285 to 350 deg F when applied.

3.4 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Spread mix at minimum temperature of 285 deg F and maximum temperature of 350 deg F.
2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.5 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Pave HMA in maximum 3” thick compacted layers.

2. Minimum atmospheric temperature shall be 55 deg F, and minimum surface temperature shall be 60 deg F. If the surface to be paved is both in sunlight and shade, pavement surface temperatures must be taken in the shade.

3. Complete compaction for Base Course before surface temperature drops below 250 deg F, and for Wearing Course before surface temperature drops below 150 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

F. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.6 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Wearing Course: Plus 1/4 inch (no minus).
3. Total Base Course plus Wearing Course shall not be less than specified thickness.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch
2. Wearing Course: 1/8 inch
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.8 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION 32 12 16

SECTION 32 13 13 – CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:

1. Driveways and roadways.
2. Parking lots.
3. Curbs and gutters.
4. Walkways.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, including admixtures.

B. Design Mixtures: For each concrete pavement mixture.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

C. All work to be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction, latest edition and supplements.

D. The Contractor shall have one copy of the Standard Specifications at the job site.

E. The Standard Specifications apply only to performance and materials and how they are to be incorporated into the Work. The legal/contractual relationship sections and the measurement and pavement sections do not apply to this document.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice."

2.2 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, Type II, low alkali. Supplement with the following:

a. Pozzolan: ASTM C618, Class F or N Fly Ash, 100 pounds maximum per cubic yard, containing one percent or less carbon. Fly ash shall not be used in excess of 15 percent by weight of total cement quantity.

2. Blended Hydraulic Cement(Alternative Cement Option):

a. Limestone: ASTM C595, Type IL, Moderate Sulfate Resistant (MS) or High Sulfate Resistant (HS.). The alkali content in the cement portion of blended cement shall not exceed 0.60 percent by mass of alkalis as Na2O + 0.658 K2O when determined in accordance with AASHTO T 105.

B. Combined Aggregates: Shall conform to the gradings in SSPWC Table 201-1.4.2.

C. Water: ASTM C 94/C 94M.

2.3 CURING MATERIALS

A. Liquid Curing Compound: ASTM C309, fugitive dye dissipating type, complying with Rule II 13 of the South Coast Air Quality Management District and Federal Air Quality Regulation 40 CFR 52.254.

B. Moisture-Retaining Cover (Curing Sheet): ASTM C 171, non-staining polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

2.4 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with Caltrans Standard Specifications - Section 84 (Federal Specification No. TT-P-1952 for Blue, Red and Green paint; and State of California Standard Specification No. PTWB-01 for White, Yellow and Black paint) with drying time of less than 45 minutes.

1. Color: White, Yellow, and Blue as indicated on the plans.

2.5 CONCRETE MIXTURES

A. Prepare design mixtures in conformance with SSPWC Section 201, with the following properties:
   1. Concrete Class:
      a. 560-CSP-3250, Maximum Slump: 5 inches
   2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45

2.6 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates to Architect for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 PORTLAND CONCRETE PAVEMENT

A. All work shall be in conformance with SSPWC Sections 201-1 and 302-6.

B. For accessibility requirements, Portland cement concrete paving shall be stable, firm, and slip-resistant and shall comply with CBC sections 11B-302 and 11B-403.

3.2 EXAMINATION

A. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.5 JOINTS

A. General: Form construction, isolation, and control joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

D. Control Joints: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of the concrete thickness to match jointing of existing adjacent concrete pavement.

3.6 CONCRETE PLACEMENT

A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

D. Screed pavement surfaces with a straightedge and strike off.

E. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
   1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on pavement surface according to manufacturer's written instructions.

   1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.

2. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturers written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these methods.

3.9 PAVEMENT TOLERANCES

A. Comply with tolerances as follows

1. Elevation: 1/4 inch
2. Thickness: Plus 3/8 inch minus 1/4 inch
3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/4 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch no minus.
6. Joint Width: Plus 1/8 inch, no minus.

3.10 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust in addition to recommended surface preparation by the paint manufacturer.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

E. Do not paint if the atmospheric temperature could drop below 50 deg F during the drying period.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement.

C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

SECTION 32 13 73 – CONCRETE PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Expansion and isolation joints within cement concrete pavement.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Compatibility and Adhesion Test Reports: From sealant manufacturer.

1.3 QUALITY ASSURANCE

A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

1. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 COLD-APPLIED JOINT SEALANTS

A. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.

1. Products:

a. Crafco Inc.; RoadSaver Silicone.
b. Dow Corning Corporation; 888.
c. Or any equivalent product.

B. Type SL Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

1. Products:

a. Crafco Inc.; RoadSaver Silicone SL.
b. Dow Corning Corporation; 890-SL.
c. Or any equivalent product.

2.4 HOT-APPLIED JOINT SEALANTS

A. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3406.

1. Products:

a. Crafco Inc.; Superseal 444/777.
b. Meadows, W. R., Inc.; Poly-Jet 3406.
c. Or any equivalent product.

2.5 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Concrete curing requirement: The concrete must be allowed to cure and dry a minimum of 7 days in good drying weather before installing sealant. An additional day of good drying weather must be allowed for each day of poor, inclement weather.

B. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

C. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience.

D. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

E. Install backer materials to support sealants during application and at position required to produce optimum sealant movement capability. Do not leave gaps between ends of backer materials. Do not stretch, twist, puncture, or tear backer materials. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

F. Install sealants at the same time backings are installed to completely fill recesses provided for each joint configuration and to produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

H. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION 32 13 73

SECTION 321825 - SYNTHETIC FIELD SPORT SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Synthetic turf system consisting of OWNER´s approved turf components, yarns, backings, infill, drainage pad, and geotextile liner or geotextile drainage fabric.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4524 - Environmental Import/Export Materials Testing.
3. Section 11 6500 – Athletic Equipment.
4. Section 31 2200 - Grading.
5. Section 31 2333 - Excavation and Fill for Synthetic Play Fields.
6. Section 32 1313 - Site Concrete Work.
7. Section 32 8413 - Potable Water Irrigation.
8. Section 33 4000 - Storm Drainage Utilities.

1.2 REFERENCES

A. ASTM International:

1. ASTM C1444 – Standard Test Method for Measuring the Angle of Repose of Free-Flowing Mold Powders.
2. ASTM D395 - ASTM D3575 – Standard Test Methods for Rubber Property Compression Set.
3. ASTM D751 - Standard Test Methods for Coated Fabrics.
4. ASTM D1335 - Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings.
5. ASTM D1577 – Standard Test Methods for Linear density of Textile Fibers.
6. ASTM D1682 – Standard Methods of Test for Breaking Load and Elongation of Textile Fabrics.
7. ASTM D2256 – Standard Test Method for Tensile Properties of Yarns by the Single-Strand Method.
8. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.
9. ASTM D3218 – Standard Specifications for Polyolefin Monofilaments.
10. ASTM D3786 – Standard Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method.
11. ASTM D4355 – Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.

12. ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
13. ASTM D4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
14. ASTM D4566 - Standard Test Methods for Electrical Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable.
15. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
16. ASTM D4546 – Standard Test Methods for One-Dimensional Swell or Collapse of Soils.
17. ASTM D4716 - Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
18. ASTM D4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.
19. ASTM D5034 - Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
20. ASTM D5261 - Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
21. ASTM D5793 - Standard Test Method for Binding Sites per Unit Length or Width of Pile Yarn Floor Coverings.
22. ASTM D5823 – Standard Test Method for Tuft Height of Pile Floor Coverings.
23. ASTM D5848 - Standard Test Method for Mass per Unit Area of Pile Yarn Floor Coverings.
24. ASTM D6241 – Standard Test Method for Static Puncture Strength of Geotextiles and Geosynthetic-Related Products Using a 50 mm Probe.
25. ASTM D6918 – Standard Test Method for Testing Vertical Strip Drains in the Crimped Condition.
26. ASTM D7003 - Standard Test Method for Strip Tensile Properties of Reinforced Geomembranes.
27. ASTM D7004 - Standard Test Method for Grab Tensile Properties of Reinforced Geomembranes.
28. ASTM D7138 - Standard Test Method to Determine Melting Temperature of Synthetic Fibers.
29. ASTM E648 – Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
30. ASTM F355 - Standard Test Method for Impact Attenuation of Playing Surface Systems, Other Protective Sports Systems, and Materials used for Athletics, Recreation and Play.
31. ASTM F1015 – Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces.

32. ASTM F1551 - Standard Test Methods for Comprehensive Characterization of Synthetic Turf Playing Surfaces and Materials.

33. ASTM F1632 - Standard Test Methods for Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Rootzone Mixes.

34. ASTM F1815 - Standard Test Methods for Saturated Hydraulic Conductivity, Water Retention, Porosity and Bulk Density of Athletic Field Rootzones.

35. ASTM F1936 - Standard Specification for Impact Attenuation of Turf Playing Systems as Measured in the Field.

36. ASTM F2765 - Standard Specification for Total Lead Content in Synthetic Turf Fibers.

37. ASTM F2898 – Standard Test Method for Permeability of Synthetic Turf Sports Field Base Stone and Surface System by Non-Confined Area Flood Test Method.

B. FIFA (Federal International Football Association):

1. FIFA 01 - Vertical Ball Rebound (Laboratory and Field Testing Required).

2. FIFA 17 - Ball Roll, 1 (Laboratory Testing Required).

3. FIFA 04a - Shock Absorption. (Laboratory and Field Testing Required).

4. FIFA 05a - Vertical Deformation (Laboratory and Field Testing Required).

5. FIFA 06 - Rotational resistance (Laboratory and Field Testing Required).

C. Norms (EN Standards), International Organization for Standardization (ISO):

1. EN 933 – Tests for Geometrical Properties of Aggregates.

2. EN 14808 – Surfaces for Sport Areas – Determination of Shock Absorption.

3. EN 14809 – Surfaces for Sport Areas – Determination of Vertical Deformation.

4. EN 22768 - General Tolerances.

D. The California Office of Environmental Health Hazard Assessment (OEHHA):

1. Proposition 65: Safe Drinking Water and Toxic Enforcement Act of 1986.

E. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.

1.3 DEFINITIONS

A. Manufacturer: Company and/or manufacture that furnishes the complete synthetic turf system starting with and including final review and approval of the base, liner, pre-molded resilient drainage pad, carpet, inlaid and painted event markings, infill materials through and including final grooming and training. In the case of synthetic turf system Resellers or Rebranders, that obtain white label synthetic turf system products upon which they apply their label for installation from other Manufacturers, they are defined as the Manufacturer herein. Manufacturers shall meet requirements of Article 1.07, Quality Assurance.

1.4 SYSTEM DESCRIPTION

A. Synthetic Field Sport Surfacing System shall meet the following requirements:

1. System shall consist of a combination approved by the turf manufacturer of synthetic turf, infill and pre-molded resilient drainage pad, geotextile liner or geotextile drainage fabric products specified in Part 2 of this Section. Synthetic field surfacing system shall have been successfully utilized on work of similar scope to that shown and specified for this Project.

2. System shall be warrantied in accordance with the provisions of Article 1.09, "Synthetic Turf Product and Performance Guarantees".

B. Environmental Requirements: Synthetic field sport surfacing components, drainage pad and infills shall be approved by the OWNER, and meet the technical requirements specified in this Section. Products will be tested by the OWNER upon arrival at the Project Site prior to installation for conformance to the CAM 17 Test Reports submitted by manufacturer and the Hazardous Waste Criteria and Human Health Screening Levels established by the OWNER. Refer to Article 1.06, "Substitution Procedures for 'or Equal" Products".

C. Performance Requirements:

1. Impact Attenuation: G-max shall be between 80 and 110 when installed and shall not exceed 165 for the length of the 8-year warranty at any one point on the field. G-max shall be tested at the completion of the installation by an independent laboratory approved by the OWNER and paid by the manufacturer. If initial g-max test result exceeds 110, the manufacturer shall take appropriate action to correct the g-max at his own expense. Proposed remedial work shall be submitted to OWNER for approval prior to execution.

2. Permeability: The system shall allow a minimum percolation rate of 25 inches per hour.

3. Surface Ball and Surface Player Performance: Synthetic turf field shall meet the performance characteristics listed below during the first year of installation.

a. FIFA 01 - Vertical Ball Rebound (Laboratory and Field Testing Required: 60 cm to 100 cm).

b. FIFA 17 - Ball Roll, 1 (Laboratory and Field Testing Required: 4 m to 10 m +/-15%).

c. FIFA 04a - Shock Absorption (Laboratory Testing Required: 55% to 70%).

d. FIFA 05a - Vertical Deformation (Laboratory and Field Testing Required: 4 mm to 11 mm).

e. FIFA 06 - Rotational resistance (Laboratory and Field Testing Required: 25 Nm to 50 Nm +/-10%).

1.5 SUBMITTALS

A. Conformance to OWNER's Approval: Products already approved by the OWNER do not require the submittal of Safety Data Sheets, Proposition 65 Statements or CAM 17 Test Reports unless there has been a change in the chemical formulation of the product, a change of name of the product or the manufacturer has changed.

1. Submit List of the synthetic turf assembly components, per Appendix 'C', "List of OWNER Approved Synthetic Turf Components", for each type of fiber and each

color used (monofilament, slit film and thatch), primary and secondary backings, drainage pad and infill materials, indicating the manufacturer and the product names. OAR to forward to the OWNER for review.

2. For products, yarn and infill colors that have not been reviewed and approved by the OWNER refer to Article 1.06, "Substitution Procedures for Or Equal Products".

B. Product Data: Submit manufacturer's technical data describing materials and installation procedures for each system component:

1. Turf and backing, including seaming tape, adhesives, inlaid and painted color data.
2. Pre-molded resilient drainage pad.
3. Resilient infill and sand.
4. Geotextile membrane.

C. Physical Properties Data:

1. Submit manufacturer's literature or test reports stating conformance to the synthetic turf physical properties specified in this Section.
2. Using the information submitted on the subparagraph above, complete Appendix 'D', Synthetic Turf Properties Comparison.

D. Shop Drawings: Submit details of construction noting proposed deviations from Contract Documents.

1. Seam layout plan of geotechnical liner showing head and side seams.
2. Synthetic turf seaming / roll layout plan.
3. Striping Plans: Provide layouts for the sports indicated on the drawings, showing field lines, markings and boundaries on the appropriate field. Provide details depicting priority on field markings and special treatment where markings of differing sports overlap or intersect. Where centerfield logo and end zone texts are indicated in the Construction Documents, provide details and indicate yarn colors.
4. Details for inserts, fixed equipment such as goal posts, covers, edge termination, utility vaults and other details required for a complete installation.

E. Sand/Infill Depth Calculation: Complete page 2 of Appendix 'B', Sand/Infill Depth Calculation, providing the following information:

1. Specific density of the proposed sand and infill materials.
2. Calculation of the proposed sand/infill ratio by weight and by volume illustrating conformance to the requirements of this Section.
3. Dimensioned section of the synthetic turf in full-scale or larger, showing turf fibers and thickness of sand and infill layers.
4. Clear fiber dimension over infill.
5. Percentage of the sand/infill depth in relation to the fiber height.

F. Mock-up: Upon installation of the synthetic turf, and prior to broadcasting of the infill, provide one square yard mock-up at a location determined by the OAR. The mock-up shall

illustrate the application of the infill to the depths established in the submitted calculations and will establish the standard of quality by which the Work will be judged.

G. Samples: Submit three sets of samples of the following items:

1. Full section sample of approximately 7-inch by 11-inch in clear presentation box depicting installed turf with infill over pre-molded resilient drainage pad. Assembled sample shall reflect the specified system components.
2. Colored turf for inlays, three samples.
3. Fiber samples, three of each color and type.
4. Separate pre-molded resilient drainage pad.
5. Separate synthetic turf rag showing fiber configuration, primary color, perforations or drainage method.
6. Infill materials, three 100 grams samples of each type.
7. Geotextile liner or geotextile drainage fabric.

H. Test Reports:

1. At installation completion submit g-max test report in conformance with ASTM F1936, refer to Article 3.09, "Field Performance Testing". Field testing equipment shall conform to ASTM F355, Procedure A.
2. Submit copies of independent field testing as outlined in paragraph 1.04, C, 3.

I. Quality Assurance and Control Submittals:

1. The synthetic field surfacing manufacturer shall provide evidence indicating that the specified materials have been successfully utilized on work of similar scope to that shown and specified for this Project. The synthetic field surfacing system examples cited shall have been completed and in use for three years without any evidence of failure.
2. Manufacturer shall submit certification indicating that installer is approved or certified by the manufacturer to install their products, in conformance to Article 1.07, "Quality Assurance".
3. Substrate Acceptability: Submit written statement issued by the synthetic field surfacing manufacturer and installer certifying the following: "We attest that all areas and surfaces designated to receive synthetic field surfacing have been inspected and found satisfactory for the reception of the Work covered under this Section; and not in conflict with "Warranty" requirements that may affect coverage. Application of synthetic field surfacing materials including liner/geotextile, pre-molded resilient drainage pad, and turf system will be construed as acceptance of finish graded base system. The inspection has included review of the finish base final compliance as-built, string-lining at 7.5 foot intervals in both directions, confirming corrections to finish stone surfaces, and providing and review of EN 22768 compliance evaluation."
4. Statement of Supervision: Upon completion of the Work, submit a written statement signed by the synthetic field surfacing manufacturer certifying that the field supervision of the manufacturer's representative was sufficient to insure proper application of the materials, that the Work was installed in accordance with

the manufacturer's instructions and Contract Documents, and that the installation meets the quality requirements of the manufacturer to perform as intended.

5. Statement of Design Suitability: Submit written statement, signed by synthetic field surfacing manufacturer and installer certifying the following: "The Construction Documents have been thoroughly reviewed and the details and the materials used in the base system, compaction and installation tolerances are compatible with the intended use."

6. Warranty Samples: Submit in conformance to Article 1.09, "Synthetic Turf Product and Performance Guarantees", and to Appendix 'A'.

   a. Sample warranty from field sport surfacing manufacturer.

J. Sample maintenance manual and maintenance check lists outlining typical maintenance schedule.

K. Statement of review of included maintenance equipment and a listing, if any, of additional maintenance equipment that may be needed.

L. Warranty Final Approved Document: Submit as part of the Closeout Submittal the Manufacturer's Warranty assigned to the OWNER.

M. Closeout Submittals: Submit Closeout Manual including all submitted product data, test data, product contact information, all associated warranties, required certifications and letter of approval, manufacturer's maintenance manuals for the proper care of the synthetic turf system, a recommended maintenance check list and all record post construction testing.

N. Post Installation Test Report Submittals:

1. Submit g-max testing report during each year of the life of the Warranty for conformance to Impact Absorbency, as indicated on Article 3.09, "Field Performance Testing".

2. Submit test report during the first year after turf installation for conformance to Surface Ball and Surface Player Performance requirements, as indicated on Article 3.09 "Field Performance Testing". In no case shall the Surface Ball and Surface Player Performance testing be done during the first three months of use.

1.6 SUBSTITUTION PROCEDURES FOR 'OR EQUAL" PRODUCTS

A. Substitutions for the synthetic field sport surfacing turf system, pre-molded resilient drainage pads or infill requested on an "or equal" basis shall be submitted for OWNER´s review within the time limitation stated in Division 00, Procurement and Contracting Requirements.

B. Substitution requests for "Or Equal" products shall be submitted as a complete package, and shall include the information requested under Article 1.05, "Submittals", and the information for chemical evaluation indicated on paragraphs below. Incomplete substitutions will be rejected.

C. Submit for chemical evaluation by the OWNER the information listed below for each type and color of synthetic turf yarns, primary and secondary backings, pre-molded resilient drainage pads and infill. Submittals shall be complete, partial submittals are not acceptable. Manufacturer and product names shall match exactly on each document submitted for review.

1. CAM 17 Test Reports from an accredited laboratory for the synthetic field sport surfacing turf system components; pre-molded resilient drainage pad and infill, as applicable. CAM 17 testing shall be per EPA Method 6020 ICP/MS and shall clearly indicate the manufacturer and product names. Test reports shall be in mg/kg units. Submit all pages of test reports, including chain of custody. The CAM 17 test report and the chain of custody documents shall clearly mention explicitly the name of the product being reviewed, which should be the same as listed in the Safety Data Sheet (SDS), even if the lab also uses an internal reference number. The lab dates need to be consecutive and logical i.e., date sampled, date received, date of the refrigerator inspection, etc. CAM 17 metal test results to be indicated on the test report are Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc. The OWNER will review the test results for risk-based screening levels (RBSL), See Appendix 'F'.

2. Safety Data Sheet (SDS) of the synthetic field sport surfacing turf components; pre-molded resilient drainage pad and infill, as applicable. SDS shall clearly indicate the SDS date, the product name, manufacturer and the Chemical Abstracts Service (CAS) for all the chemicals constituting the product indicating its percentage in the product. Total of CAS percentage shall add to one hundred percent. If the product manufacturer preference is not to disclose a proprietary component on the SDS, but on a separate document, the product manufacturer should contact the OWNER's to sign a non-disclosure agreement.

3. The product manufacturer shall indicate on the SDS or submit a letter on their letterhead, signed by a company official and indicating his/her title, listing the chemicals constituting the product that are found on the California Safe Drinking Water and Toxic Enforcement Act of 1986, Proposition 65. If there are no chemicals in the product that are listed on the Proposition 65, the statement should indicate this fact. For reference, the link to the Safe Drinking Water and Toxic Enforcement Act of 1986 list of chemicals is:

   http://www.oehha.ca.gov/prop65/prop65_list/Newlist.html

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Synthetic manufacturer shall have at least three years of continuous business under the same name (includes DBA) and or same organizational structure. Companies that have formed alliances and or business partnerships to comply with any of the synthetic turf manufacturer requirements listed here will not be accepted.

2. Synthetic turf manufacturer shall have at least sixty projects of equal scope in the past five years, with 20% being in a similar climate. These installations shall clearly show experience in football, soccer, or baseball, as applicable to this project. In defining systems as similar size and type both, synthetic and sand and synthetic infill systems, can be included as equal and interchangeable. Traditional type non-infill systems are not considered similar. Indoor installations are not considered similar. Fields with a gross area of less than that contained in this Project are not considered similar.

3. The synthetic turf manufacturer shall as a matter of standard practice install systems using their own employees as installation supervisor and installation

crews. In cases in which the synthetic turf manufacturer installs using licensed distributors or licensed installers both the turf supplier and the work by the installation company shall be covered by the manufacturer product warranty. In all cases, the manufacturer shall have an employee supervisor on site representing the manufacturer at key points, such as during the base inspection and anchor system installation. At minimum the Synthetic Turf Representative shall observe the condition of the anchor shelf, the top of the base, the fine graded topping stone, as-built and surface evenness testing, and the permeability testing in cases where the base provides system drainage.

B. Installer Qualifications:

1. Installer, if other than direct employees of the Manufacturer, shall be approved and certified by turf manufacturer to install their products.

2. Installer shall have at least three years of continuous business under the same name (includes DBA) and or same organizational structure.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver products in original unopened packaging with legible manufacturers' identification. All materials shall be stored in a dry place out of the direct sunlight and protected from damage and vandalism.

B. Bulk Materials: Deliver materials bulk materials in clean, washed and covered trucks to eliminate contamination during transportation. On site stockpiling locations shall be preapproved by OAR prior to deliveries. Stockpile only in areas free of debris and away from drainage routes. Cover materials with plastic or geotextile fabric if materials are to be stockpiled more than 48 hours.

C. Immediately upon delivery of materials to the Project Site, and prior to installation, CONTRACTOR shall inspect and verify the following:

1. Damaged or defective items.

2. Appropriate turf pile height and roll lengths.

3. Uniformity of perforations.

4. Arrival of adhesives in sealed, dry containers.

1.9 SYNTHETIC TURF PRODUCT AND PERFORMANCE GUARANTEES

A. Keep work in repair without expense to OWNER as far as it concerns defects in workmanship or materials for a period of not less than eight (8) years from date of Substantial Completion.

1. The Warranties covered under this Article shall be issued under the following structure:

a. In all cases the synthetic turf system Product Warranty shall be provided by the Manufacturer.

b. In cases in which the synthetic turf system is provided by a synthetic turf system Reseller/Rebrander or other similar business relationship, the Reseller or Rebrander Warranty shall be provided by the Reseller/Rebrander. In this case the Reseller/Rebrander shall carry a

Warranty from the Manufacturer of the white label product responsible for the manufacture of their systems.

c. Separate installation companies shall not serve as the manufacturer.

d. The Warrantees shall be assigned to the OWNER and delivered to the OWNER as part of the Closeout Manual.

B. Eight Year Synthetic Turf Manufacturer's Product and System Warranty:

1. Provide a manufacturer's 8 year product warranty for the synthetic turf system including carpet and infill materials and their installation.

2. The Premolded Resilient Drainage Pad Manufacture shall provide a separate Manufacturer's 20 year Product Warranty. The Synthetic Turf Manufacturer shall include the Premolded Resilient Drainage Pad Manufacturer's Warranty as part of their closeout documents.

3. Where the Infill Manufacture provides a separate Manufacturer's Product Warranty the Synthetic Turf Manufacturer shall include the Infill Manufacturer's Warranty as part of their closeout documents. If not, the infill warranty shall be the responsibility of the manufacturer.

4. Where the Geotextile/Liner Manufacture provides a separate Manufacturer's Product Warranty the Synthetic Turf Manufacturer shall include the Geotextile/Liner Manufacturer's Warranty as part of their closeout documents. If not the Geotextile/Liner warranty shall be the responsibility of the manufacturer.

5. This warranty shall include all materials and components of the finished system including the assembly of the carpet system, and components including yarn, fibers, backing materials, seaming tape, adhesives, sewing yarn, infill products, anchoring method.

6. The warranty shall be in writing and shall be signed by the synthetic turf field manufacturer.

7. Warranty shall include removal and replacement of materials as required to repair the synthetic field surfacing and or system at no cost to the OWNER. This includes any base system remediation created as a result of removal and replacement and full clean-up, disposal and finish work associated with any Warranty remediation effort.

8. The Warranty shall also cover fiber breakdown due to defects, poor quality components, premature wear, and fiber loss. Fibers specified herein shall be capable of providing useful service throughout the full period of the Warranty.

a. At the end of the Warranty period the fiber shall retain a minimum of 70% of the original fiber weight, fiber strength, and fiber height. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values.

b. At the end of the Warranty period the exposed fiber above the infill shall have less than 50% fiber damage for spinneret and tape type fibers associated with wear. Wear shall include shortening of fiber due to breakage, shredding (excessive fibrillation), loss of fiber due to fiber pull-out, internal fiber separation along cross-sectional seams or edges, failure or fracture seams perpendicular to the length of the fiber, fiber threading

(change in cross-section to thread or hair like section), and UV degradation. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values.

c. At the end of the Warranty period the exposed fiber above the infill shall have less than 50% fiber damage for slit-film type fibers associated with wear. Wear shall include shortening of fiber due to breakage, shredding (excessive fibrillation), loss of fiber due to fiber pull-out, internal fiber separation along cross-sectional seams or edges, failure or fracture seams perpendicular to the length of the fiber, fiber threading (change in cross-section to thread or hair like section), and UV degradation. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values.

9. The warranty shall cover the backing system against non-wear related breakdown.

10. The warranty shall cover the infill materials against excessive breakdown of granulate material due to normal use. Over the life of the system the infill material shall retain 70% of its shape, size and resiliency. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values. At no time during the life of the system shall the infill material exhibit cohesive or agglomerate behavior or shall it become permanently deformed.

11. This warranty shall include all components of the system in its coverage. The warranty shall not limit the types of sports and recreation activities or uses that would be typical of similar installations. Use such as band or other marching activities shall not limit the Warranty.

12. The field system shall be suitable for small vehicle loads and shall be covered by the Warranty for vehicle use methods as approved and directed by the manufacturer. The manufacturer shall provide instructional information for driving on the synthetic surface and include vehicle size and weight limitations.

C. Warranty repairs associated with meeting the ASTM F1936 g-max performance requirements shall be for full coverage of the repair necessary to bring the system into compliance regardless of the age of the installation.

D. Field Performance Testing:

1. G-max Testing: Starting with the completion of construction, CONTRACTOR shall retain a third-party certified testing laboratory and shall perform g-max testing and provide reports during each year of the life of the Warranty. The testing and reporting procedures for this testing shall meet the requirements of ASTM F1936 except that the number of tests and the locations shall comply with the requirements herein. Testing shall be performed locations as required under ASTM F1936 plus at the center field, at the goal locations for all sports, and at 10 yards inside the corners. This results in a total of 19 test locations per year. Testing shall consist of shock attenuation per ASTM F355 procedure A. Initial g-max shall be between 80 and 110. The g-max shall not change more than 10% at any one location per year over the life of the Warranty, however, at no time during the life of the warranty shall the g-max shall be 165 or greater. In cases where the results of the above testing exceed the specified values on the per year and maximum value, the condition shall be corrected by the synthetic surface manufacturer. The

synthetic surface manufacturer shall provide adequate confirmation testing to confirm that the mitigative measures were effective. At no time in the life of the Warranty shall the g-max be 165or greater at any one point on the field. Results of this testing shall be provided to the OWNER, ARCHITECT and other assigns each year after testing.

2. Surface Ball and Surface Player Performance Testing: During the first month of the year of use the field shall be tested for the following to assure that the delivered field meets industry accepted player surface and ball surface performance characteristics as defined in paragraph 1.04.C.3. Results of this testing shall be provided to the OWNER and ARCHITECT in the form of a post installation submittal. Where deviation from these values exists, the field shall be brought into compliance. Testing shall be completed at the ten (10) ASTM F1936 test points plus at the center field, at the goal locations for all sports, and at the 10 yards inside the corners. For performance values refer to Article 1.04 "System Description", paragraph, "Performance Requirements".

3. Infill Depth Measurements for Uniformity and Consistency: Prior to acceptance of the field by the ARCHITECT and OWNER, the infill depth shall be field measured by an independent testing's agency and recorded. The measurements shall be made at 5 yard intervals along the length of the field with five measurement points even spaced across the field. Measurements shall be made by depth gauge method and be to an accuracy of +/- 1 mm. The test point data shall be summarized in a report listing average depth and range. In cases where the average depth is outside of the indicted range the field shall be brought into compliance by the Manufacturer.

E. If non-compliant areas are located as part of the yearly assessment, the extent of these areas shall be determined by performing the above test towards each end zone and each sideline until tests meeting requirements are obtained. The point at which the results meet the requirements of this specification shall represent the limit of non-compliant turf and shall be remedied to be in-compliance with the requirements.

F. Testing shall be performed by a certified independent lab approved by the OWNER.

G. Provide a copy of the complete Policy for all warrantees, assigned to the OWNER, and insurances for the turf system. Letters from the CONTRACTOR or manufacturer are not adequate. The Policy shall clearly indicate type of policy and policy rating for the full eight years. The insured warranty shall fully cover the cost of turf replacement.

1.10 PATENT RIGHTS AND INFRINGEMENTS

A. Certain systems, materials, cross-sections, and installations methods may be protected by the U.S. Patent Office Law based on patents filed and obtained by manufacturers or vendors listed or not listed in this document. It is the responsibility of manufacturers to assure that the materials, cross-sections, and installations methods proposed for use on this project are not protected by existing patents or rights of others or licenses. It is the intent of these documents to promote the use of systems that fall within framework of non-patented or expired patents. It is the intent of the technical documents to specify a product not to promote or induce the use of intellectual property belonging to others or promote infringement of any known or currently not known patents, licenses or rights of others.

B. Manufacturers providing pricing of the Turf System as well as the Selected Manufacturer of the Turf System shall hold the OWNER and ARCHITECT harmless as to any liability

and or costs of any type, including but not limited to legal costs, royalties, replacement costs, etc. associated with any claim by Others associated with any patents or infringement thereof.

C. Manufacturers providing pricing of the Turf System as well as the selected Manufacturer of the Turf System shall notify the OWNER and ARCHITECT in writing as to any knowledge relating to the infringement of existing patents or rights of others prior to the date of bidding. Such notice shall be specific, and directly and clearly outline the infringement and further outline the steps necessary to avoid any such infringement. Once any such infringement of existing patents, licenses or rights of others is brought to the attention of the ARCHITECT and OWNER, addendum documents will be issued to allow bidding to proceed without out conflict.

1.11 TRAINING

A. Training Instruction: Provide a four hour on-site training instructional program for the OWNER's maintenance staff for proper use of field maintenance equipment and proper long-term maintenance of synthetic turf system for warranty compliance. The training instruction shall be filmed and summarized on a flash drive included in the Close-out Documents. Training session shall be coordinated through the OAR.

a. Sweeper: Provide one SMG TCA 1400 Groomer-Sweeper with patented brush/sweeper/loosening tine design. Deliver to job site.

1.12 OWNER'S TEST AND INSPECTION

A. OWNER reserves the right to retain a third-party certified testing laboratory to perform CAM 17 testing of the synthetic turf, pre-molded resilient drainage pad and infill, as it is being manufactured and or prior to shipment to the Project Site. Products not passing the CAM 17 test will be rejected and shall not be shipped to the Project Site and shall be replaced with new products meeting the specifications at no cost to OWNER.

B. Upon delivery of synthetic turf surfacing materials, pre-molded resilient drainage pad and infill to the project site, the OWNER's representative will take samples for CAM 17 testing for assessment for Hazardous Waste Criteria and Human Health Screening Levels. Materials not meeting the levels established by the OWNER will be rejected and shall be removed from the site by the CONTRACTOR and replaced with new products meeting the specifications at no cost to OWNER.

C. Upon delivery of synthetic turf materials to the project site the project inspector or the OAR will inspect materials for conformance to Contract Documents. Inspection will include measuring of turf pile height, face weight, yarn thickness, thickness of rolls, tuft binds and turf row spacing. Products not meeting the specified physical properties will be rejected and shall be removed from the site by the CONTRACTOR and replaced with new products meeting the specifications at no cost to OWNER.

D. CONTRACTOR shall pay testing and inspecting costs of products found to be noncompliant.

E. CONTRACTOR shall be responsible for the delay associated with non-conforming materials and the related schedule impacts of his Work and adjacent Work of others.

PART 2 – PRODUCTS

2.1 GEOTEXTILE LINER

A. Geotextile liner for use above the compacted base and below the pre-molded resilient drainage pad shall be scrim reinforced high strength polyethylene film consisting of four-layer reinforced laminate. Outer layers shall consist of high-strength, polyethylene film manufactured using virgin grade resins and formulated with thermal and UV stabilizers, reinforced with 1000 denier scrim reinforcement laid in a diagonal 3/8" grid with an additional scrim at 3" on center in the machine direction with high strength polyethylene film laminated together with two molten layers of polyethylene.

1.	Profile thickness meeting all other performance characteristics		20 mil min
2.	Color		gray/black
3.	Weight		74 pounds MSF
4.	Tensile Strength (scrim break)	ASTM D7003	75lbf/in
5.	Tensile Elongation at Break (scrim)	ASTM D7003	20%
6.	Tensile Elongation at Break (film)	ASTM D7003	700%
7.	Tensile Grab	ASTM D7004	114lbs.
8.	Trapezoid Tear (diagonal)	ASTM D4566	70lbs.
9.	Mullen Burst,	ASTM D751	120 psi
10.	Puncture Resistance (CBR)	ASTM D6241	300 lb.

B. Edge Adhesive: The liner system shall include edge and perforation adhesive material to properly adhere liner to the surrounding concrete shelves and concrete encasement.

C. Manufactured rolled goods of reinforced polyethylene shall be prefabricated into custom size panels specific to this project using thermal fusion seam welding. Factory seams shall be fully bonded across the scrim-to-scrim lapped area and shall be made so that the fusion bond extends to the top edge of the sheet. No flaps or loose edges shall be present on the top or bottom of the finished panel.

D. Manufacturers and Products:

1. DURA SKRIM.
2. Western Environmental Liner.
3. Hercutex.
4. Equal.

2.2 GEOTEXTILE DRAINAGE FABRIC

A. Geotextile Fabric: For use above the compacted base and below the pre-molded resilient drainage pad shall be needle-punched nonwoven fabric composed of polypropylene or polyester fibers and formed into a stable network. Fabric shall be resistant to biological degradation, chemicals, alkalis and acids naturally found in soils, and shall meet the requirements of AASHTO M 288, Class 3. Roll size shall be 15 feet by 360 feet.

1. Geotextile fabric shall meet the following Minimum Average Roll Values (MARV):
    a. Weight: 4.0 Oz/SY per ASTM D5261.

b. Grab Tensile Strength: Not less than 120 pounds per ASTM D4632.

c. CBR Puncture: 250 lbs. per ASTM D3786.

d. Trapezoidal Tear: 45 lbs. per ASTM D4533.

e. Flow Rate: Not less than 120 gal/min/ft2 per ASTM D4491.

f. Elongation: Not less than 50% per ASTM D6241.

g. UV Resistance after 500 hours: Not less than 70% per ASTM D4355.

h. Permittivity: 1.70 Sec-1 per ASTM D4491.

i. Apparent Opening Size: 70 US Sieve, per ASTM D4751.

2. Manufacturers and Products:

a. TenCate Geosynthetics Americas, Mirafi 140N.

b. US Fabrics, Inc., 120NW.

c. Propex Fabrics, Inc., Geotex 451.

d. Equal.

2.3 PREMOLDED RESILIENT DRAINAGE PAD

A. Premolded resilient drainage pad system (PRDP) shall be approved by OWNER and manufactured specifically for the intended use, made from fully recycled and or recyclable materials, with a minimum permeability rate of 30 to 60 inches per hour, and have a full 25 year minimum system warranty. PRDP shall be interlocking tile only. Rolled goods without expansion capabilities are not acceptable.

B. Required Performance Values for approved products:

PROPERTY	STANDARD	UNIT	Brock Powerbase YSR
Material			Expanded Polypropylene
Interlocking Method			Interlocking Panels
Length x Width x Thickness			73.5”x 49.0”x 1.0”
Thermal Expansion Control			Interlocking System
Vertical Drainage	ASTM F1551	in/hr	>500
Lateral Transmissivity	ASTM D4716	gpm/ft	0.50
Impact attenuation (Gmax)	ASTM F355		80 <90
Shock absorption	EN 14808	%	70

Vertical deformation	EN 14809	mm(in)	7.2
Compression Set @ 25% deflection	ASTM D395	in	After 24 hrs remaining deflection was 0.09in. (90.1%)
Compression Set @ 50% deflection	ASTM D395	in	
Recycle or Reuse			

C. Tiles shall be fully interlocking and fabricated from fully repurposed, recycled or virgin materials:

1. Brock Power Base YSR: Lightweight injection-molded plastic units usually supplied as tiles in palette format; minimum size shall be 73.5”X49” units with hollow clover shaped cups rising from a strong open grid allowing maximum water infiltration and conveyance. Tiles shall have interlocking hooks to allow easy assembly. Hooks shall allow for temperature movement.

2. Equal products approved by the OWNER.

2.4 SYNTHETIC FIELD (CARPET) MATERIALS

A. The Turf Carpet System shall be an OWNER preapproved hybrid synthetic turf system comprised of both slit film and monofilament fibers tufted into a backing system and be one of the following systems meeting the requirements outlined within this Section.

1. Manufacturer: Astroturf.

a. Product Name: AstroTurf Rootzone 3D3 Blend 45mm.

b. Fiber Height: 45 mm.

B. Synthetic field surfacing materials and components must be approved by the OWNER.

C. Approved Manufacturers and Turf Components. Lists below show the basic field colors: green, white and yellow. Refer to Paragraph 1.06.C for turf yarn color chemical evaluation and approval procedures.

1. AstroTurf:

a. Turf Yarn: Polyethelene Fibers monofilament and slit film by Synthetic Turf Resources Corporation (STR).

b. Primary Backing: Polyester by Carpet & Rug Backing (CRB).

c. Primary Backing: Polypropylene by Carpet & Rug Backing (CRB).

d. Secondary Backing: Polyurethane backing by Universal Textile Technologies (UTT).

e. OWNER Approved Colors:

1) Green: Monofilament Field Green 8200 and slit film Field Green 8200.

2) White: Monofilament White 1000 and slit film White 1000.

3) Yellow: Monofilament Yellow 3700 and slit film Yellow 3700.

D. Yarn shall be a hybrid monofilament and slit film tape polyethylene grass-like fibers with a texturized rootzone. Polyethylene yarn shall be proven athletic caliber designed and fabricated specifically for outdoor use and stabilized to resist the effect of ultraviolet degradation, heat, foot traffic, water and airborne pollutants. Fiber shall possess the following physical characteristics:

1. Synthetic Turf Fibers:

ASTM:	Component:	Performance Value:
D1577	Fiber Denier Monofilament	7200 – 12,000 (4 to 8 ends)
D1577	Fiber Denier Thatch Layer	4400 – 6500 (4 to 8 ends)
D1577	Fiber Denier Slit film	5,000 – 10,000
D1682/ D5034	Grab Tear	200 lbs. Min (width and length)
D2256	Breaking Load Strength	8 lbs.
D3218	Monofilaments - Thickness	Monofilament: 200 to 360 microns, Thatch: 100 to 150 microns Silt film 100 to 120 microns
D7138	Melting Temperature Nylon	210°C Min
D7138	Melting Temperature Polypropylene	120°C Min
F2765	All Yarn	Less than 40 ppm

2. Primary Backing:

ASTM:	Component:	Performance Value:
D4491	Geotextiles by Permittivity	60 gpm
D4533	Tearing Strength of Geotextiles	250 lbs.
D4632	Breaking Load and Elongation	200 lbs.
D5034	Breaking Strength and Elongation	200 lbs.
D5848	Mass Per Unit Area of Pile Yarn	8 Oz/SY min.
	Woven Polypropylene	5-10 Oz/SY.
	Non-woven polypropylene	0.5 -1.0 Oz/SY.

3. Secondary Backing: Backing system shall be fully coated except for patented finger drainage row systems. Latex is not permitted.

ASTM:	Component:	Performance Value:
D5848	Mass Per Unit Area of Pile Yarn	23 Oz/SY
D5848	Urethane Coating	24 - 28 Oz/SY

E. Seaming Tape: Polyethylene terephthalate (PET) based, spun-bonded, nonwoven fabric tape designed specifically to work with turf adhesives for seaming synthetic turf; 12 inches wide. Seaming tape shall be compatible with the secondary backing system and adhesive. PET Spunbonded Nonwoven by Oxco Incorporated, Ultrabond Turf Tape by Mapei, or OWNER's approved equal.

F. Adhesives for bonding tufted synthetic turf and seaming tape:

1. One-component polyurethane resin based, moisture-curing adhesive. Ultrabond Turf PU 1K by Mapei, or OWNER approved equal.

2. Two-component, solvent and water-free polyurethane adhesive. The two-part component consisting of component A, a thick paste, and component B, a fluid hardener. Ultrabond Turf PU 2K, Parts A and B, by Mapei, or OWNER's approved equal.

2.5 SYNTHETIC TURF FABRICATION

A. Synthetic turf systems shall only be fabricated of turf and backing components approved by the OWNER. Turf system shall be a Hybrid Turf with Thatch Zone System.

B. Synthetic Turf System Performance:

1.	ASTM D1335	Tuft Bind	> 12 pounds
2.	ASTM D2859	Ignition	PASS 8 Times
3.	ASTM D5793	Binding Sites	2.66 to 3.00 per inch 0.375 – 0.500 inch
4.	ASTM D5823	Pile Height	1.75 to 2.00 inch
		Pile Height Thatch	Match infill depth
5.	ASTM D5848	Mass Per Unit Area of Pile Yarn	48 to 58 oz./yd^2

C. Synthetic turf systems shall meet the technical requirements for binding sites and fiber configuration indicated below.

1. All products shall have row spacing less than or equal to 0.50 inch.

2. System using A-B needle tufting shall be tufted on a 3/8 inch row spacing.

3. Systems using A-B needle tufting shall divide the thatch zone yarn approximately equally between both the A and B needles.

4. Systems using common needle tufting shall include hybrid fiber and thatch fiber on the common needle.

D. Fibers shall be tufted to a finished pile height of 1.75 to 2.00 inches. Turf systems using yarn or ribbon that shrinks during the manufacturing process shall oversize pile height so that the finish product including any process related shrinkage meets these requirements. Height shall be measured after heating processes that would shrink the fibers. Process related fiber shrinkage shall not relieve the manufacturer from providing a full 1.75 to 2.00 inch product.

E. Ends Needle: Minimum of six ends per needle. Where fibers are bundled in two colors a minimum of three ends per color per needle.

F. Binding Sites: Stiches per inch shall be greater than or equal to 2.66 inches and less than or equal to 3.00 inches. Gauge shall be greater than or equal to 0.375 inches and less than or equal to 0.500 inches.

G. Perforation shall be made at a minimum rate of one 3/16 inch perforation on a 3” inches by 4” grid over the full surface area of the carpet.

1. Perforations shall be punched to true size or burned to a dimension that allows for proper size after any shrinkage that may take place.

2. Feed rates shall be adjusted to assure that perforations meet the 3/16 inch dimension after fabrication.

3. Under sized perforations will not be accepted.

4. Non-perforated systems shall not be accepted except for patented finger drainage systems.

5. Perforations shall be uniform such that 85% of the perforations shall meet or exceed the above minimum dimension.

6. Perforations not meeting the minimum size noted above shall not be clustered or grouped on the backing.

7. Where sections or areas of backing exceeding 4 square feet have no perforations, that entire carpet roll shall be rejected by plant quality control.

H. Perforation size shall be confirmed in the factory as part of the manufacturing quality control process. Rolls where sections do not meet the requirements shall be rejected. Rolls that contain perforations where perforations with a dimension of less than 3/16 inch diameter shall be rejected. Carpet rolls that have less than 85% full size perforations shall be rejected.

I. Finished Turf System:

1.	Fabric Width	15' (other manufacturing widths are not acceptable)
2.	Tuft Bind Strength w/o infill:	>12.0 lbs.
3.	Tufting Configuration of Fibers	Where row spacing is greater than 0.5 inch Monofilament (spinneret, extruded) and Silt Film Tape fibers shall be bundled into a single tufting needle to avoid streaking associated with alternating fiber type rows.
4.	Grab Tear Strength (length):	>250 lbs.
5.	Pill Burn Test	Pass (with filling)
6.	Permeability	25” per/hr for the full system cross-section
7.	Depth of Infill	1.30” infill depth for 1.75” systems and 1.50" infill depth for 2.00” systems (at completion of installation) Infill depths shall represents substantially 74% to 78% of the fiber height when initially installed.
8.	Colors (standard)	Standard manufacturer’s colors See below for inlays.
9.	Tufted/Inlaid Lines	

	Tufted/Inlaid Full Local Requirements	Full markings for the project specific sports
10.	Tufted/Inlaid goal location marks	Match color of sports identified above. Goal marks shall be 4" square.
11.	Logos	
12.	Colored Endzones	
13.	Painted Markings	None. All Markings shall be inlaid

J. Tuft lines in the factory to the maximum extent practical. Keep field inlaid lines to a minimum. The intent is to maximize the factory work to the extent practical. Where rules require dashes such as hash marks or media lines they shall be cut in as dashes and not continuous cuts. Tufted in lines shall be tufted with the line located at least 4” from the edge of the panel wherever practical.

1. Logo shall be tufted with two wire wide ghost lines at all locations where the logo interrupts game lines. Method of logo development shall be approved by the ARCHITECT.

K. Adhesives for bonding tufted synthetic turf and drainage pad shall be as recommended by the synthetic turf manufacturer and be a one-part moisture cured polyurethane. Adhesives must be appropriate for weather and climatic conditions. Submit separate adhesives suitable for use in cold weather, warm weather and wet weather. Seaming of underlayment pad must be done with less than a 6” wide spray adhesive width. Excessive coverage of the padding with adhesive is unacceptable. Adhesives shall be OWNER approved products of Synthetic Surfaces Inc., or other OWNER approved equal products.

L. Cord for sewing seams of both the pad and turf shall be as recommended by the synthetic turf manufacturer.

M. Rolls shall be arranged to minimize seams at high wear areas of the field and to maximize factory tufted markings.

N. The finished playing surface shall appear as mowed grass with no irregularities and shall afford excellent traction for conventional athletic shoes of all types. The finished surface shall resist abrasion and cutting from normal use. The system shall be ideal for soccer, lacrosse, field hockey, football, intramural and recreational use.

O. The turf shall be tufted in a manner to provide alternating colors when indicated on the project.

2.6 INFILL MATERIAL

A. Synthetic Infill shall be approved by the OWNER and be free of hazardous materials as defined by current Local, State and Federal regulations. Infill shall conform to the Standard Consumer Safety Specification for Toy Safety. Synthetic surfacing manufacturer shall select infill materials that will assure their warranty of the synthetic turf system.

B. System 1: Cool Infill System.

1. Coated Silica Sand Infill shall be T°Cool and meet the following requirements.

2. Flammability ASTM E648 Non-flammable.

3. Evaporative Cooling up to 50 Degrees.

4. Mesh Size: 16/30
5. Hardness: 6-8 Mohs
6. Angle of Repose: +/- 30 degrees
7. Dust: Negligible

C. System 2: Cool Infill System.

1. Coated Silica Sand Infill shall be Hydrochill and meet the following requirements.
2. Flammability ASTM E648 Non-flammable.
3. Evaporative Cooling up to 50 Degrees.
4. Mesh Size: 16/30
5. Hardness: 6-8 Mohs
6. Angle of Repose: +/- 30 degrees
7. Dust: Negligible

PART 3 – EXECUTION

3.1 BASE APPROVAL

A. For excavation and fill refer to Section 31 2333, Excavation and Fill for Synthetic Play Fields.

B. Prior to installation of geotextile liner or geotextile drainage fabric installation, and the manufacturer shall:

1. Review the record as-built drawings provided by the Base Contractor/Subcontractor for the finish grade of the compacted base and the survey provided under Section 31 2333. As-built elevations shall be with 0.02 feet plus or minus of design grades.
2. Review the base for approval and acceptance. The Manufacturer shall provide the final surface planarity test using EN 22768 for Base Evenness base and coordinate and confirm the necessary compliance adjustments with the base installer.
3. Provide string-line inspection and evaluation of finish grade of the base and coordinate and confirm the necessary compliance adjustments with the base provider. Check the planarity of the base using string lines at 7.5 foot intervals in both directions and at all field marking locations prior to installation of the geotextile liner (or geotextile drainage fabric) and pre-molded resilient drainage pad. Check the uniformity of the base using a 10 foot straight edge and a tolerance of plus or minus 1/4” and mark in the field the locations of any grade deviation that exceeds the specified tolerances.
4. Coordinate and confirm the necessary compliance adjustments with the base installer as each of the above review points.
5. Review compaction test results for conformance to specified values indicated on Section 31 2333.
6. Perform review final permeability compliance testing using ASTM F2898 at five locations determined by the ARCHITECT.

7. Review and confirm the vertical and horizontal location of conduit risers, access box hand holes, equipment, yard boxes, and drainage structures. These shall be set precisely to line and grade to meet intended finish relationship with surface and base and coordinated with turf access cover systems.

8. Notify OWNER and ARCHTIECT of deviations from Contract Documents and issues that will adversely affect the installation of drainage layer and synthetic turf or the manufacturer's warranty.

9. Upon corrections of the base provide an updated as-built survey depicting compliance for submittal to the ARCHITECT. Once approved provide a letter indicating that the base meets the requirements of the turf system manufacturer, and that the base as installed will allow the synthetic turf system to function properly and as intended without jeopardizing the warranty of the turf system. Include in the letter the compaction and percolation test results.

3.2 PROJECT CONDITIONS

A. Weather and Climate: If weather and climatic conditions are having or will have an adverse effect on installation, work shall be delayed until the adverse condition has passed. No work shall be performed during periods in which the temperature is below 40 degrees F and rising or during wet or rainy days. Material shall be applied only when dry.

B. Infill shall be installed at a rate and manner that avoids burying of fibers due to high temperature fiber laydown.

C. Adjacent and Concurrent Construction: Installation shall not take place until the completion of the adjacent or concurrent construction operations which generate dust, airborne abrasives, or any other by-product that would be harmful to the turf material.

D. Provide ballast/weighing as required to prevent wind impacts to materials during installation.

3.3 INSTALLATION OF GEOTEXTILE LINER

A. Base surface shall be uniform and free of rocks, depressions, voids, and irregularities that might damage liner. Install liner in accordance with liner manufacturer's written recommendations.

1. Liner shall be placed in the perimeter trench first. Trench liner shall be separate from the liner on the field. Overlap field and trench liners a minimum of 18" in the direction of the water flow. Liner shall completely line the perimeter trench.

2. Overlap ends of liners a minimum of 8 inches. Laps shall be overlapped in direction the water flows.

3. Panels shall run side to side with excess material for connection to anchoring curbs and to accommodate expansion, and for side to side panel overlap. Where side anchor curbing includes an integral drain and where liner must interface with an open graded stone trench provide a minimum of 8 feet in additional length to account for side to side contraction and expansion and attachment. Provide adequate panel width to allow for 4 feet of panel overlap on each side and 4 additional feet of width at ends to account for contraction and expansion and attachment.

4. Liner shall be attached to the perimeter concrete curb using 20-gauge coiled straps with a staggered nail pattern and concrete nails at 12 inches on center.

5. Place a suitable amount of ballast on the liner to prevent displacement by wind. The ballast shall be of a type that will not damage the liner.

6. Direct loading over the fabric by traffic is not allowed. A minimum of 6 inches of material cover must be placed prior to traffic.

7. Repair punctured or torn liner by overlapping additional fabric and joining in accordance with manufacturer's recommendations.

3.4 INSTALLATION OF GEOTEXTILE DRAINAGE FABRIC

A. Install the geotextile drainage fabric on a clean compacted surface after as-built and surface are approved by the ARCHITECT. Wrinkles shall be stretched out and sections installed over the subgrade and into the full extent of the collector trenches. Lap sections per manufacturer's recommendation and follow with manufacturer's instructions . The fabric shall not be seamed such that seam edges are in close proximity to excavated trenches. Seams shall be installed in a manner which follows typical roofing style overlap with higher elevation sheets above low elevation sheets.

B. The geotextile drainage fabric shall be installed over the full subgrade and side walls and line the collector pipe trenches. Edges shall be brought up along the face of the anchor curbing to create a bathtub effect at the collector.

C. The geotextile drainage fabric shall be pulled tight to remove any wrinkles that could impact the planarity of the premolded drainage board.

3.5 INSTALLATION OF PRE-MOLDED RESILIENT DRAINAGE PAD

A. Surfaces to receive the pre-molded resilient drainage pad shall be cleaned before installation commences and shall be maintained in that condition throughout the process.

B. The pre-molded resilient pad shall be installed by the turf manufacturer or under their direct supervision of the synthetic turf installer, and the turf manufacturer's representative.

C. Synthetic turf installer and manufacturer representative shall inspect and certify in writing acceptance of the drainage layer prior to installation of the turf.

D. Areas where the finish stone surface is impacted by the process shall be corrected to acceptable tolerances.

E. Provide 1.0 inch gap at turf anchor curb shelf to allow for thermal movement of PRDP.

3.6 INSTALLATION OF SYNTHETIC TURF

A. Synthetic field surfacing shall be installed in accordance with manufacturer's recommendations and written instructions.

1. Handling of materials shall be performed in a manner that does not damage rolls. Damage to rolls during the handling or installation process may require that the full roll be replaced at no cost to OWNER.

2. Installer shall inspect the backing of all carpet rolls as the carpet is rolled out to assure that the perforations meet the specifications.

B. Lay rolls across the field over the drainage layer, following installation sequence shown on the shop drawings.

C. Areas where the finish stone surface is impacted by the process shall be corrected to acceptable tolerances. Geotextile shall be removed and reinstalled to facilitate this process.

D. Firmly secure perimeter of the field to curbs with stainless steel anchors in accordance with Contract Documents.

E. Back inlaid lines using seaming tape with a width of 18", adhered to the pad prior to installation of the inlaid line or logo. Inlaid lines in which the backing is extended 6" beyond the edge of the line on both sides can be used in lieu of seaming tape. In no case shall lines be shaved into the system.

3.7 INSTALLATION OF INFILL MATERIAL

A. Broadcast infill in a manner that prevents uneven distribution. Keep overlap between passes to a minimum. Passes must have a limited amount of overlap to prevent shallow infill depth areas.

1. Maintain a clean staging area to prevent contamination of the infill material with on-site materials. If a clean area cannot be provided, manufacturer shall provide a reinforced protection membrane beneath the material to prevent contamination during storage and blending.

2. Keep the path from the staging area to the field clean to prevent tracking of contaminants onto the playing field.

3. Keep equipment such as Bobcats, hoppers, sweepers, and rakes, clean and free of contaminants.

B. The rate of infilling shall be such that fibers are not trapped beneath infill material. All trapped fibers shall be groomed raked free of trapping infill material to the satisfaction of OWNER.

1. Inspect infill material coverage as progress advances to assure fibers are not trapped. If trapped fibers are observed correct conditions by static grooming.

3.8 SIGNAGE

A. Install OWNER furnished signs at pedestrian and vehicular entry points to the field. Sign provides rules to be followed to maintain safety and operational conditions of synthetic turf field. Coordinate locations with OAR. Fasten signs to chain link fence fabric using hard rings or fence clips at each corner of sign.

3.9 INSPECTION

A. Once installation is complete, the entire surface shall be inspected by the manufacturer, Project Inspector, OAR, and ARCHITECT, with particular attention to seams and edge attachments. Corrections shall be noted and rectified prior to Substantial Completion. Lines shall be checked for straightness, correctness and installation. Each sport lines and correct dimensions shall be verified. Entire area shall be checked for wrinkles, evenness of field infill and planarity deficiencies.

3.10 FIELD PERFORMANCE TESTING

A. The Manufacturer is responsible for delivering a project the meets all required testing and for providing all test results to the ARCHITECT for review and approval.

B. G-max Testing: Shall be performed at construction completion and during each year of the life of the Warranty. Initial g-max testing for shock attenuation on completed field shall be a maximum average of 80-110 per ASTM F1936.

1. Testing shall be performed at the locations required by ASTM F1936, and in addition testing shall be performed at the center field, at the goal locations for all sports, and at ten yards inside the corners, resulting in a total of 19 test locations.

2. Testing shall consist of shock attenuation per ASTM F1936 and testing equipment shall conform to ASTM Standard F355 – Procedure A. G-max shall not change more than 10% at any one location per year over the life of the Warranty, however, at no time during the life of the warranty shall the g-max be less than 165. In cases where the results of the g-max testing exceeds the specified values, the condition shall be corrected by the manufacturer. The manufacturer shall provide adequate information to confirm that the mitigation measures were effective. At no time in the life of the Warranty shall the g-max be 165 or greater at any one point on the field. Results of this testing shall be provided to the OWNER and ARCHITECT each year after testing.

3. If non-compliant areas are located as part of the yearly assessment, the extent of these areas shall be determined by performing the g-max test towards each end zone and each sideline until tests meeting requirements are obtained. The point at which the results meet the requirements of this specification shall represent the limit of non-compliant turf and shall be remedied to be in-compliance with the requirements.

C. Surface Ball and Surface Player Performance Testing: During the first year of installation the field will be tested to the Surface Ball and Surface Player Performance Testing FIFA standards indicated on Article 1.04, “System Description”, paragraph “Performance Requirements”. Testing shall be performed at the same ten designated test points for the ASTM F1936 tests. Where deviation from these values exists, the field shall be brought into compliance. This is not intended to require FIFA Certification. Testing shall be completed after infill settlements which may impact performance of the system.

D. Infill Depth Measurements for Uniformity and Consistency: Prior to acceptance of the field by the OWNER the infill depth will be field measured by an independent testing’s agency and recorded. The measurements shall be made at five yard intervals along the length of the field with five measurement points even spaced across the field. Measurements shall be made by depth gauge method and be to an accuracy of +/- 1 mm. The test point data shall be summarized in a report listing average depth and range. In cases where the average depth is outside of the indicated range the field shall be brought into compliance by the CONTRACTOR.

3.11 PROTECTION OF SURFACING

A. Protect the Work of this section from traffic until Substantial Completion.

3.12 FINAL GROOMING

A. The manufacturer shall perform a final grooming of the synthetic turf field in conjunction with the maintenance training session to bring the field to a game ready condition.

3.13 CLEAN UP

A. Remove rubbish and waste materials and legally dispose of off Project site. Leave the work area in condition ready for immediate occupancy and use by the OWNER.

B. Usable remnants of the turf fabric shall become property of the OWNER. Store as directed by the OAR.

END OF SECTION 321825

APPENDIX 'A"

SYNTHETIC TURF PRODUCT AND PERFORMANCE GUARANTEES

A. Keep work in repair without expense to OWNER as far as it concerns defects in workmanship or materials for a period of not less than eight (8) years from date of Substantial Completion.

1. The Warranties covered under this Article shall be issued under the following structure:

a. In all cases the synthetic turf system Product Warranty shall be provided by the Manufacturer.

b. In cases in which the synthetic turf system is provided by a synthetic turf system Reseller/Rebrander or other similar business relationship, the Reseller or Rebrander Warranty shall be provided by the Reseller/Rebrander. In this case the Reseller/Rebrander shall carry a Warranty from the Manufacturer of the white label product responsible for the manufacture of their systems.

c. Separate installation companies shall not serve as the manufacturer.

d. The Warrantees shall be assigned to the Owner and delivered to the Owner as part of the Closeout Manual

B. Eight Year Synthetic Turf Manufacturer's Product and System Warranty:

1. Provide a manufacturer's 8 year product warranty for the synthetic turf system including carpet and infill materials and their installation.

2. The Premolded Resilient Drainage Pad Manufacture shall provide a separate Manufacturer's 20 year Product Warranty. The Synthetic Turf Manufacturer shall include the Premolded Resilient Drainage Pad Manufacturer's Warranty as part of their closeout documents.

3. Where the Infill Manufacture provides a separate Manufacturer's Product Warranty the Synthetic Turf Manufacturer shall include the Infill Manufacturer's Warranty as part of their closeout documents. If not, the infill warranty shall be the responsibility of the manufacturer.

4. Where the Geotextile/Liner Manufacture provides a separate Manufacturer's Product Warranty the Synthetic Turf Manufacturer shall include the Geotextile/Liner Manufacturer's Warranty as part of their closeout documents. If not the Geotextile/Liner warranty shall be the responsibility of the manufacturer.

5. This warranty shall include all materials and components of the finished system including but the assembly of the carpet system, and components including yarn, fibers, backing materials, seaming tape, adhesives, sewing yarn, infill products, anchoring method.

6. The warranty shall be in writing and shall be signed by the synthetic turf field manufacturer.

7. Warranty shall include removal and replacement of materials as required to repair the synthetic field surfacing and or system at no cost to the OWNER. This includes any base system remediation created as a result of removal and replacement and

full clean-up, disposal and finish work associated with any Warranty remediation effort.

8. The Warranty shall also cover fiber breakdown due to defects, poor quality components, premature wear, and fiber loss. Fibers specified herein shall be capable of providing useful service throughout the full period of the Warranty.

    a. At the end of the Warranty period the fiber shall retain a minimum of 70% of the original fiber weight, fiber strength, and fiber height. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values.

    b. At the end of the Warranty period the exposed fiber above the infill shall have less than 50% fiber damage for spinneret and tape type fibers associated with wear. Wear shall include shortening of fiber due to breakage, shredding (excessive fibrillation), loss of fiber due to fiber pull-out, internal fiber separation along cross-sectional seams or edges, failure or fracture seams perpendicular to the length of the fiber, fiber threading (change in cross-section to thread or hair like section), and UV degradation. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values.

    c. At the end of the Warranty period the exposed fiber above the infill shall have less than 50% fiber damage for slit-film type fibers associated with wear. Wear shall include shortening of fiber due to breakage, shredding (excessive fibrillation), loss of fiber due to fiber pull-out, internal fiber separation along cross-sectional seams or edges, failure or fracture seams perpendicular to the length of the fiber, fiber threading (change in cross-section to thread or hair like section), and UV degradation. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values.

9. The warranty shall cover the backing system against non-wear related breakdown.

10. The warranty shall cover the infill materials against excessive breakdown of granulate material due to normal use. Over the life of the system the infill material shall retain 70% of its shape, size and resiliency. Periods between the start of warranty coverage to the end of the warranty period shall be covered based on a relative prorated percentage of these values. At no time during the life of the system shall the infill material exhibit cohesive or agglomerate behavior or shall it become permanently deformed.

11. This warranty shall include all components of the system in its coverage. The warranty shall not limit the types of sports and recreation activities or uses that would be typical of similar installations. Use such as band or other marching activities shall not limit the Warranty.

12. The field system shall be suitable for small vehicle loads and shall be covered by the Warranty for vehicle use methods as approved and directed by the manufacturer. The manufacturer shall provide instructional information for driving on the synthetic surface and include vehicle size and weight limitations.

C. Warranty repairs associated with meeting the ASTM F1936 g-max performance requirements shall be for full coverage of the repair necessary to bring the system into compliance regardless of the age of the installation.

D. Field Performance Testing:

1. G-max Testing: Starting with the completion of construction, CONTRACTOR shall retain a third party certified testing laboratory and shall perform g-max testing locations and report during each year of the life of the Warranty. The testing and reporting procedures for this testing shall meet the requirements of ASTM F1936 except that the number of tests and the locations shall comply with the requirements here in. Testing shall be performed locations as required under ASTM F1936 plus at the center field, at the goal locations for all sports, and at 10 yards inside the corners. This results in a total of 19 test locations per year. Testing shall consist of shock attenuation per ASTM F355 procedure A. Initial g-max shall be between 80 and 110. The g-max shall not change more than 10% at any one location per year over the life of the Warranty, however, at no time during the life of the warranty shall the g-max shall be 165 or greater. In cases where the results of the above testing exceed the specified values on the per year and maximum value, the condition shall be corrected by the synthetic surface manufacturer. The synthetic surface manufacturer shall provide adequate confirmation testing to confirm that the mitigative measures were effective. At no time in the life of the Warranty shall the g-max be 165or greater at any one point on the field. Results of this testing shall be provided to the OWNER, ARCHITECT and other assigns each year after testing.

2. Surface Ball and Surface Player Performance Testing: During the first month of the year of use the field shall be tested for the following to assure that the delivered field meets industry accepted player surface and ball surface performance characteristics as defined in paragraph 1.04.C.3. Results of this testing shall be provided to the OWNER and ARCHITECT in the form of a post installation submittal. Where deviation from these values exists, the field shall be brought into compliance. Testing shall be completed at the ten (10) ASTM F1936 test points plus at the center field, at the goal locations for all sports, and at the 10 yards inside the corners. For performance values refer to Article 1.04 “System Description”, paragraph, “Performance Requirements”.

3. Infill Depth Measurements for Uniformity and Consistency: Prior to acceptance of the field by the ARCHITECT and OWNER, the infill depth shall be field measured by an independent testing’s agency and recorded. The measurements shall be made at 5 yard intervals along the length of the field with five measurement points even spaced across the field. Measurements shall be made by depth gauge method and be to an accuracy of +/- 1 mm. The test point data shall be summarized in a report listing average depth and range. In cases where the average depth is outside of the indicted range the field shall be brought into compliance by the Manufacturer.

E. If non-compliant areas are located as part of the yearly assessment, the extent of these areas shall be determined by performing the above test towards each end zone and each sideline until tests meeting requirements are obtained. The point at which the results meet the requirements of this specification shall represent the limit of non-compliant turf and shall be remedied to be in-compliance with the requirements.

F. Testing shall be performed by a certified independent lab approved by the OWNER.

G. Provide a copy of the complete Policy for all warrantees, assigned to the OWNER, and insurances for the turf system. Letters from the CONTRACTOR or manufacturer are not adequate. The Policy shall clearly indicate type of policy and policy rating for the full eight years. The insured warranty shall fully cover the cost of turf replacement.

Warranty commences on: _____

Warranty expires on: _____

CONTRACTOR: _____

Address: _____

Telephone: _____

Signature: _____

Name & Title: _____

Date: _____ Telephone: _____

TURF MANUFACTURER: _____

Address: _____

Telephone: _____

Signature: _____

Name & Title: _____

Date: _____ Telephone: _____

TURF INSTALLER : _____

Address: _____

Telephone: _____

Signature: _____

Name & Title: _____

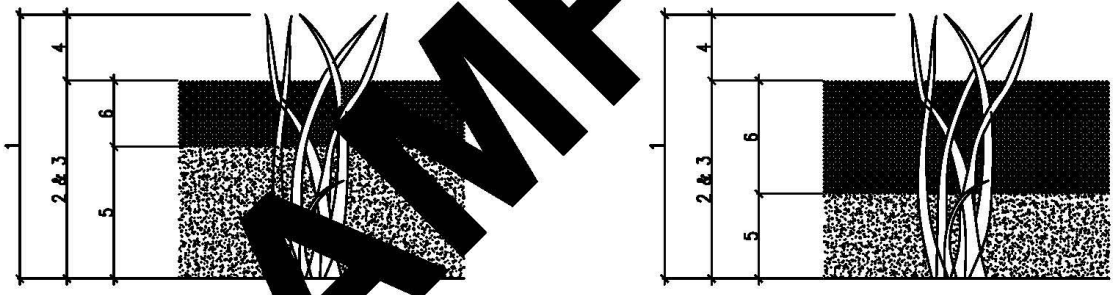
Date: _____ Telephone: _____

END OF APPENDIX 'A'

APPENDIX 'B'
SAND/INFILL DEPTH CALCULATION

SAMPLES OF SAND/EPDM DEPTH CALCULATION

		2" & 1.75" FIBER HEIGHT WITH 80% TO 20% SAND TO EPDM RATIO	2" & 1.75" FIBER HEIGHT WITH 60% TO 40% SAND TO EPDM RATIO
A.	TURF MANUFACTURER / SYSTEM NAME:		
B.	INFILL MANUFACTURER AND NAME:		
C.	SAND SOURCE:		
D.	WEIGHT OF ONE CF OF SAND:	91.86 lbs.	91.86 lbs.
D.	SPECIFIC DENSITY OF SAND:	91.86 / 62.4 = 1.47	91.86 / 62.4 = 1.47
E.	WEIGHT OF ONE CF OF EPDM INFILL:	45.59 lbs.	45.59 lbs.
E.	SPECIFIC DENSITY OF EPDM INFILL:	45.59 / 62.4 = 0.73	45.59 / 62.4 = 0.73
F.	RATIO SAND / INFILL BY WEIGHT:	80 % TO 20 %	60 % TO 40 %
G.	SPECIFIC VOLUME OF SAND:	1 / 1.47 = 0.68	1 / 1.47 = 0.68
H.	SPECIFIC VOLUME OF EPDM INFILL:	1 / 0.73 = 1.37	1 / 0.73 = 1.37
	RATIO BY VOLUME CALCULATION:	SAND: 0.68 X 80 % = 0.544 EPDM: 1.37 X 20 % = 0.274 SAND / EPDM RATIO: 0.544 / 0.274 = 1.985	RATIO BY VOLUME CALCULATION: SAND: 0.68 X 60 % = 0.408 EPDM: 1.37 X 40 % = 0.548 SAND / EPDM RATIO: 0.408 / 0.548 = 0.744
I.	SAND / EPDM RATIO BY VOLUME:	2 TO 1	3 TO 4



1.	FIBER HEIGHT:	2" / 1.75"	2" / 1.75"
2.	TOTAL DEPTH:	1.5" / 1.3"	1.5" / 1.3"
3.	% FIBER DEPTH / FIBER HEIGHT:	75% / 74.2%	75% / 74.2%
4.	EXPOSED FIBER DEPTH:	0.5" / 0.45"	0.5" / 0.45"

SAND & EPDM DEPTH CALCULATION:
SAND + EPDM = 1.5"
SAND / EPDM RATIO IS 2:1, 2X + 1X = 1.5"
SAND = 1", EPDM – 0.5"

5.	DEPTH OF SAND INFILL:	1" / 0.87"	0.64" / 0.56"
6.	DEPTH OF EPDM INFILL:	0.5" / 0.43"	0.86" / 0.74"

SPECIFIC DENSITY OR SPECIFIC GRAVITY: RATIO OF DENSITY OF A MATERIAL TO THE DENSITY OF WATER: $SG = \rho / \rho W$
WHERE SG = SPECIFIC GRAVITY, ρ = DENSITY OF THE MATERIAL (lbs/CF), ρW = DENSITY OF WATER (62.4 lbs/CF).

SPECIFIC VOLUME: IS THE TOTAL VOLUME (V) OF A SUBSTANCE DIVIDED BY ITS TOTAL MASS (M). IS THE RECIPROCAL OF THE SPECIFIC DENSITY.

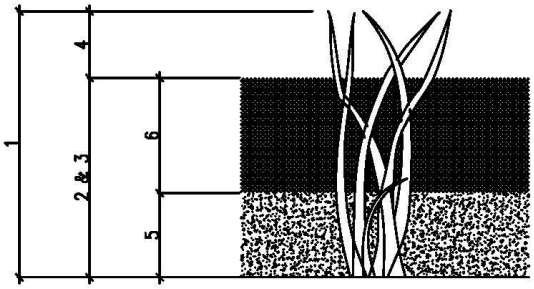
SAMPLE

SAND/EPDM DEPTH CALCULATION

A. TURF MANUFACTURER / SYSTEM NAME: _____
B. INFILL MANUFACTURER AND NAME: _____
C. SAND SOURCE: _____
D. WEIGHT OF ONE CF OF SAND: _____
D. SPECIFIC DENSITY OF SAND: _____
E. WEIGHT OF ONE CF OF INFILL: _____
E. SPECIFIC DENSITY OF INFILL: _____
F. RATIO SAND / INFILL BY WEIGHT: _____
G. SPECIFIC VOLUME OF SAND: _____
H. SPECIFIC VOLUME OF INFILL: _____

RATIO BY VOLUME CALCULATION:
SAND:
INFILL:
SAND / INFILL RATIO:

I. SAND / INFILL RATIO BY VOLUME: _____



1. FIBER HEIGHT: _____
2. TOTAL DEPTH OF SAND–INFILL: _____
3. % FIBER DEPTH / FIBER HEIGHT: _____
4. EXPOSED FIBER DEPTH: _____

SAND & INFILL DEPTH CALCULATION:

5. DEPTH OF SAND: _____
6. DEPTH OF INFILL: _____

SPECIFIC DENSITY OR SPECIFIC GRAVITY: RATIO OF DENSITY OF A MATERIAL TO THE DENSITY OF WATER: $SG = \rho / \rho W$
WHERE SG = SPECIFIC GRAVITY, ρ = DENSITY OF THE MATERIAL (lbs/CF), ρW = DENSITY OF WATER (62.4 lbs/CF).

SPECIFIC VOLUME: IS THE TOTAL VOLUME (V) OF A SUBSTANCE DIVIDED BY ITS TOTAL MASS (M). IS THE RECIPROCAL OF THE SPECIFIC DENSITY.

APPENDIX 'B' – PAGE 2 OF 2

END OF APPENDIX 'B'

APPENDIX 'C'
LIST OF OWNER APPROVED SYNTHETIC TURF COMPONENTS

PROJECT NAME: _____

CONTRACTOR: _____

Provide the exact name of each of the turf system components approved by the OWNER. Add products to the list if needed.

1. TURF:
   - Manufacturer: _____
   - Brand Name: _____
   - a. Monofilament: _____
     - Green: _____
     - White: _____
     - Yellow: _____
   - b. Slit Film: _____
     - Green: _____
     - White: _____
     - Yellow: _____
   - c. Rootzone: _____
     - Green: _____
     - White: _____
     - Yellow: _____
   - d. Primary Backing: _____
   - e. Secondary Backing: _____

2. PREMOLDED RESILIENT DRAINAGE PAD:
   - Manufacturer: _____
   - Brand Name: _____

3. INFILL:
   - Manufacturer: _____
   - Brand Name: _____

4. SAND:
   - Source: _____

END OF APPENDIX 'C'

APPENDIX 'D'

SYNTHETIC TURF PROPERTIES COMPARISON			
Synthetic Turf Fibers			
Test Method	**Definition of test**	**LAUSD Spec Requirement**	**Proposed Turf System**
D1577	Fiber Denier Monofilament	7200 – 12,000 (4 to 8 ends)	
D1577	Fiber Denier Thatch Layer	4400 – 6500 (4 to 8 ends)	
D1577	Fiber Denier Slit film	5,000 – 10,000	
D1682/D5034	Grab Tear	200 lbs. Min (width and length)	
D2256	Breaking Load Strength	8 lbs.	
D3218	Thickness	Monofilament: 200 to 360 microns	
D3218	Thickness	Thatch: 100 to 150 microns	
D3218	Thickness	Silt film 100 to 120 microns	
D7138	Melting Temperature Nylon	210 °C Min	
D7138	Melting Temperat. Polypropylene	120°C Min	
Primary Backing			
D4491	Geotextiles by Permittivity	60 gpm	
D4533	Tearing Strength of Geotextiles	250 lbs.	
D4632	Breaking Load and Elongation	200 lbs.	
D5034	Breaking Strength and Elongation	200 lbs.	
D5848	Mass Per Unit Area of Pile Yarn	8 Oz/SY min.	
D5848	Woven Polypropylene	5-10 Oz/SY.	
D5848	Non-woven polypropylene	0.5 -1.0 Oz/SY.	
Secondary Backing:			
D5848	Mass Per Unit Area of Pile Yarn	23 Oz/SY	
D5848	Urethane Coating	24 - 28 Oz/SY	
Synthetic Turf System Performance			
D1335	Tuft Bind	> 12 pounds	
D2859	Ignition	PASS 8 Times	
D5793	Binding Sites	2.66 to 3.00 per inch	
D5793	Binding Sites	0.375 – 0.500 inch	
D5823	Pile Height	1.75 to 2.00 inch	
D5823	Pile Height Thatch	Match infill depth	
D5848	Mass Per Unit Area of Pile Yarn	48 to 58 oz./yd^2	

END OF APPENDIX 'D'

SECTION 328400 - PLANTING IRRIGATION – DOMESTIC WATER

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. It is the intent of the specifications and drawings that the finished system is complete in every respect and shall be ready for operation satisfactory to the Owner.

B. The work shall include all materials, labor, services, transportation, and equipment necessary to perform the work as in these specifications, and as necessary to complete the contract.

1.2 CONSTRUCTION DRAWINGS

A. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, site utilities and architectural features.

B. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications. When an item is shown on the plans but not shown on the specifications or vice versa, it shall be deemed to be as shown on both. The Landscape Architect shall have final authority for clarification. When a conflict occurs between an item shown on the plan and as shown on the specifications, the Landscape Architect shall have final authority for clarification.

C. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in the design. Such obstructions or differences should be brought to the attention of the Landscape Architect as soon as detected. In the event this notification is not performed, the Irrigation Contractor shall assume full responsibility for any revisions necessary.

1.3 QUALITY ASSURANCE

A. Provide at least one English speaking person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the manufacturer’s recommended methods of installation and who shall direct all work performed under this section.

B. Manufacturer’s directions and detailed drawings shall be followed in all cases where the manufacturer of articles used in this contract furnishes directions covering points now shown in the drawings and specifications.

C. All local, municipal and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

D. All materials supplied for this project shall be new and free from any defects. All defective materials shall be replaced immediately.

1.4 SUBMITTALS

A. Materials List:

1. After award of contract and before any irrigation system materials are delivered to the job site, submit to the Landscape Architect a complete list of all irrigation systems, materials, or processes proposed to be furnished and installed as part of this contract.
2. Show manufacturer's name and catalog number for each item, furnish complete catalog cuts and technical data, and furnish the manufacturer's recommendations as to the method of installation.
3. No substitutions will be allowed without prior written acceptance by the Landscape Architect or Owner's authorized representative.
4. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

B. Substitutions:

If the Contractor wishes to substitute any equipment or materials for those listed on the irrigation drawings and specifications, he may do so by providing the following information to the Landscape Architect for approval:

1. A written statement indicating the reason for making the substitution and the difference in installed price if the item is accepted.
2. Catalog cut sheets, technical data and performance information for each substitute item.

1.5 EXISTING CONDITIONS

A. The Contractor shall verify and be familiar with the locations, size and detail of points of connection provided as the source of water, electrical supply, and telephone line connection to the irrigation system.

B. Irrigation design is based on the available static pressure shown on the drawings. Contractor shall verify static water on the project prior to the start of construction. Should a discrepancy exist, notify the Landscape Architect and Owner's authorized representative prior to beginning construction.

C. Prior to cutting into the soil, the Contractor shall locate all cables, conduits, sewer lines, and other utilities as are commonly encountered underground and he shall take proper precautions

not to damage or disturb such improvements. If a conflict exists between such obstacles and the proposed work, the Contractor shall promptly notify the Landscape Architect who will arrange for relocations. The Irrigation Contractor will proceed in the same manner if a rock layer or any other such conditions are encountered.

D. The Contractor shall protect all existing utilities and features to remain on and adjacent to the project site during construction. Contractor shall repair, at his own cost, all damage resulting from his operations or negligence.

E. The Irrigation Contractor shall coordinate with the General Contractor for installation of required sleeving as shown on the plans.

1.6 INSPECTIONS

A. The Landscape Architect shall be permitted to visit and inspect at all times any part of the work and shall be provided safe access for such visits.

B. Where the specifications require work to be tested by the Contractor, it shall not be covered over until accepted by the Landscape Architect, Owner's authorized representative, and/or governing agencies. The Irrigation Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing. Should any work be covered without testing or acceptance, it shall be, if so ordered, uncovered at the Irrigation Contractor's expense.

C. Inspections will be required for the following at a minimum. Landscape Architect may opt to review photographs of pressure test (with image of pressure gauge and time stamps) and sample dripline layout.

1. Pressure test of irrigation main line (Three hours at 150 PSI)
2. Sample layout of dripline irrigation.
3. Coverage test of irrigation sprinkler system.
4. Final inspection prior to start of maintenance period
5. Final acceptance

D. Site observations and testing will not commence without the record drawings a prepared by the Irrigation Contractor. Record drawings must be complete and up to date for each site visit.

E. Work which fails testing and is not accepted will be retested.

1.7 STORAGE AND HANDLING

A. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect the installation work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Landscape Architect and Owner.

B. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings under cover until ready to install. Transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load.

1.8 CLEANUP AND DISPOSAL

A. Dispose of waste, trash, and debris in accordance with applicable laws and ordinances and as prescribed by authorities having jurisdiction. Bury no such waste material and debris on the site. Burning of trash and debris will not be permitted. The Contractor shall remove and dispose of rubbish and debris generated by his work and workmen at frequent intervals or when ordered to do so by the Owner's authorized representative.

B. At the time of completion the entire site will be cleared of tools, equipment, rubbish and debris which shall be disposed of off-site in a legal disposal area.

1.9 TURNOVER ITEMS

A. Record Drawings:

1. Record accurately on one set of contract drawings all changes in the work constituting departures from the original contract drawings.
2. The changes and dimensions shall be recorded in a legible and workmanlike manner to the satisfaction of the Landscape Architect. Prior to final inspection of work, submit record drawings to the Landscape Architect for review and approval.
3. Dimensions from/to permanent points of reference such as buildings, sidewalks, curbs, etc. shall be shown. Data on record drawings shall be recorded on a day to day basis as the project is being installed. All lettering on drawings shall be minimum 1/8 inch in size.
4. Show locations of the following items:

    a. Point of connection (including water meters, backflow preventors, master control valves, etc.)
    b. Routing of sprinkler pressure lines (dimensions shown at a maximum of 100 feet along routing and at all changes in direction)
    c. Gate valves
    d. Automatic remote control valves
    e. Quick coupling valves
    f. Routing of control wires
    g. Irrigation controllers
    h. Related equipment (as may be directed)

5. Maintain record drawings on site at all times. Upon completion of work, transfer all as-built information and dimensions to a clean set of bond prints, using red, waterproof ink.

B. Controller Charts:
1. Record drawings must be approved by Landscape Architect before controller charts are prepared.
2. Provide one controller chart for each automatic controller. Chart shall show the area covered by the particular controller.
3. The chart is to be a reduced copy of the actual "record" drawing. In the event the controller sequence is not legible, when the drawing is reduced, it shall be enlarged to a readable size. Print shall be black and white, with a different color used to indicate the area of coverage for each station.

4. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 10 millimeters in thickness, with a matte finish.

C. Operation and Maintenance Manuals:

1. Two individually bound copies of operation and maintenance manuals shall be delivered to the Landscape Architect or Owner's authorized representative at least 10 calendar days prior to final inspection. The manuals shall describe the material installed and the proper operation of the system.
2. Each complete, bound manual shall include the following information:

a. Index sheet stating Contractor's address and telephone number, duration of guarantee period, list of equipment including names and addresses of local manufacturer representatives.
b. Operating and maintenance instructions for all equipment.
c. Spare parts list and related manufacturer information for all equipment.
d. Guarantee Statement.

D. Equipment:

1. Supply as a part of this contract the following items:

a. One (1) tool for disassembly and adjustment of each type of sprinkler head used in the irrigation system.
b. Padlock and two (2) keys for backflow enclosure (if used).
c. Two keys for each automatic controller.
d. Two quick coupler keys with a 3/4 inch bronze hose bib, bent nose type with hand wheel and two coupler lid keys.
e. One valve box cover key or wrench.
f. One 5-foot tee wrench for operating butterfly valves (if used).
g. Two (2) extra sprinkler heads of each size and type.

2. The above equipment shall be turned over to Owner's authorized representative at the final inspection.

1.10 COMPLETION

A. At the time of the pre-maintenance period inspection, the Landscape Architect, Owner's authorized representative, and governing agencies will inspect the work, and if not accepted, will prepare a list of items to be completed by the Contractor. At the time of the post-maintenance period or final inspection, the work will be reinspected and final acceptance will be in writing by the Landscape Architect, Owner's authorized representative, and governing agencies.

B. The Owner's authorized representative shall have final authority on all portions of the work.

C. After the system has been completed, the Contractor shall instruct Owner's authorized representative in the operation and maintenance of the irrigation system and shall furnish a complete set of operating and maintenance instructions.

D. Any settling of trenches which may occur during the one-year period following acceptance shall be repaired. Repairs shall include the complete restoration of all damage to planting, paving or other improvements of any kind as a result of the work.

1.11 GUARANTEE

A. The entire sprinkler system, including all work done under this contract, shall be unconditionally guaranteed against all defects and fault of material and workmanship, including settling of backfilled areas below grade, for a period of one (1) year following the filing of the Notice of Completion.

Should any problem with the irrigation system be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to Owner within ten (10) calendar days of receipt of written notice from Owner. When the nature of the repairs, as determined by the Owner, constitutes an emergency (i.e. broken pressure line) the Owner may proceed to make repairs at the Contractor's expense. Any and all damages to existing improvements, resulting either from faulty materials or workmanship, shall be repaired at the Contractor's expense.

B. Guarantee shall be submitted on Contractor's own letterhead as follows:

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation 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 defective material during the period of one year from date of filing of the Notice of Completion 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 10 calendar days following written notification by the Owner. In the event of failure to make such repairs or replacements within the time specified after receipt of written notice from 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 NAME:

PROJECT LOCATION:

CONTRACTOR NAME:

ADDRESS:

TELEPHONE:

SIGNED:

DATE:

PART 2 - PRODUCTS

2.1 SUMMARY

Use only new materials of the manufacturer, size and type shown on the drawings and specifications. Materials or equipment installed or furnished that do not meet Landscape Architect's, Owner's, or governing agencies standards will be rejected and shall be removed from the site at no expense to the Owner.

2.2 PIPING

A. Pressure supply line from point of connection through basket strainer unit shall be Type "K" copper or brass pipe.

B. Pressure supply lines 3 inches in diameter and larger shall be Class 200 PVC with bell-and-gasket joints. Piping shall conform to ASTM D2241.

C. Pressure supply lines 2 inches to 2-1/2 inches in diameter shall be Class 315 solvent weld PVC. Piping shall conform to ASTM D1784.

D. Pressure supply lines 1-1/2 inches and smaller in diameter shall be Schedule 40 solvent weld PVC. Piping shall conform to ASTM D1784.

E. Non-pressure lines 3/4 inches in diameter and larger downstream of the remote control valve shall be Schedule 40 PVC or as stated on Irrigation Materials Legend on plans. Non-pressure lines 1 inch and larger to conform to ASTM D1784.

2.3 METAL PIPE AND FITTINGS

A. Brass pipe shall be 85 percent red brass, ANSI, IPS Standard 125 pounds, Schedule 40 screwed pipe.

B. Fittings shall be medium brass, screwed 125-pound class.

C. Copper pipe and fittings shall be Type "K" sweat soldered.

2.4 PLASTIC PIPE AND FITTINGS

A. Pipe shall be marked continuously with manufacturer's name, nominal pipe size, schedule or class, PVC type and grade, National Sanitation Foundation approval, Commercial Standards designation, and date of extrusion.

B. All plastic pipe shall be extruded of an improved PVC virgin pipe compound in accordance with ASATM D2241 or ASTM D1784.

C. All PVC fittings shall be standard weight Schedule 80 for constant-pressure mainline fittings and screwed fittings, and Schedule 40 for non-pressure lateral fittings and shall be injection molded of an improved virgin PVC fitting compound. Slip PVC fittings shall be the "deep

socket" bracketed type. Threaded plastic fittings shall be injection molded. All tees and ells shall be side gated. All fittings shall conform to ASTM D2466 and D2467.

D. All threaded nipples shall be standard weight Schedule 80 with molded threads and shall conform to ASTM D1785.

E. All solvent cementing of plastic pipe and fittings shall be a two-step process, using primer and solvent cement applied per the manufacturer's recommendations. Cement shall be of a fluid consistency, not gel-like or ropy. Solvent cementing shall be in conformance with ASTM D2564 and ASTM D2855.

F. When connection is plastic to metal, female adapters shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be non-lead base Teflon paste, tape, or equal.

G. Expanding foam sealant for sleeving and conduit shall be a 2-part, 98% closed sell urethane foam, capable of sealing ¾" to 6" diameter conduits with multiple pipe and cable configurations. Sealant shall have good adhesion to PVC pipe and cable jacket surfaces with 120 lb. compressive strength (ASTM D1621) and shall be capable of holding 9.5 PSI water pressure continuous and 5 PSI gas or vapor continuous.

2.5 VALVES

A. Gate Valves:

1. Gate valves shall be of the manufacturer, size, and type indicated on the drawings.
2. Gate valves shall have threaded ASTM B-62 bronze body, bonnet and wedge, silicon bronze stem, and malleable iron handwheel.
3. All Gate valves shall have a minimum working pressure of not less than 150 psi and shall conform to AWWA standards.

B. Quick Coupler Valves:

1. Quick coupler valves shall be of the manufacturer, size, and type indicated on the drawings.
2. Quick coupler valves shall be brass with a wall thickness guaranteed to withstand normal working pressure of 150 psi without leakage. Valves shall have ¾ female threads opening at base, with two-piece body. Valves to be operated only with a coupler key, designed for that purpose. Coupler key is inserted into valve and a positive, watertight connection shall be made between the coupler key and valve. Hinge cover shall be the locking type constructed of brass with a rubber-like vinyl cover.

C. Automatic Control Valves:

1. Automatic control valves shall be of the manufacturer, size, and type indicated on the drawings.
2. Automatic control valves shall be electrically operated.
3. Automatic control valves shall include manual flow adjustment.

D. Anti-drain Valves:

1. Anti-drain valves shall be of the manufacturer, size and type indicated on the drawings.
2. Anti-drain valves shall have 18-8 stainless steel springs and valve stems with Buna-N seals.
3. Anti-drain valves will have threaded connections the size of the riser or pipe they are to be installed onto, or the next available size. No slip connection anti-drain valves are allowed.

2.6 VALVE BOXES

A. Valve boxes shall be fabricated from a durable, weather-resistant plastic material resistant to sunlight and chemical action of soils.

B. The valve box cover shall be green in color and secured with a hidden latch mechanism or bolts.

C. The cover and box shall be capable of sustaining a load of 1,500 pounds.

D. Valve box extensions shall be by the same manufacturer as the valve box.

E. Automatic control valve boxes shall be 16 inch x11 inch x12 inch rectangular size. Valve box covers shall be marked “RCV” with the valve identification number “heat branded” onto the cover in 2-inch high letters/numbers.

F. Ball valve and quick coupler valve boxes shall be 10-inch diameter circular size. Valve box covers shall be marked with either “BV” or “QCV” with the valve identification “heat branded” onto the cover in 2-inch high letters.

2.7 AUTOMATIC CONTROLLER

A. Automatic controller shall be of the manufacturer, size, and type indicated on the drawings.

B. Automatic controller enclosures shall be of the manufacturer, size, and type indicated on the drawings. Enclosure shall be vandal-resistant, ventilated and waterproof.

2.8 ELECTRICAL

A. All electrical equipment shall be NEMA Type 3, waterproofed for exterior installations.

B. All electrical work shall conform to local codes and ordinances.

2.9 LOW VOLTAGE CONTROL WIRING

A. Remote control wire shall be direct-burial AWG-UF type, size in no case smaller than 14 gauge.

B. Connections shall be either epoxy-sealed packet type or Penn-Tite connectors.

C. Ground wires shall be white in color. Control wires shall be red (where two or more controllers are used, the control wires shall be a different color for each controller. These colors shall be noted on the “Record Drawings” plans located on controller door).

2.10 IRRIGATION HEADS

A. Sprinkler heads shall be of the manufacturer, size, type, with radius of throw, operating pressure and discharge rate indicated on the drawings.

B. Pop-up heads and riser heads shall be used.

2.11 DRIP IRRIGATION COMPONENTS

A. Dripline tubing shall be of the manufacturer, model number and distribution (emitter flow and spacing) indicated on the drawings.

B. Drip emitters, bubblers and micro-sprays shall be of the manufacturer and model number indicated on the drawings.

C. Distribution tubing, connectors and insert or compression fittings shall be of the manufacturer and type indicated on the drawings.

2.12 RAIN SENSOR

Rain sensor shall be of the manufacturer, size and type indicated on the drawings.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Inspections:

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that irrigation system may be installed in accordance with all pertinent codes and regulations, the original design, the referenced standards, and the manufacturer's recommendations.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Landscape Architect or Owner's authorized representative.
2. Do not proceed with installation in areas of discrepancy until all discrepancies have been resolved.

C. Grades:

1. Before starting work, carefully check all grades to determine that work may safely proceed, keeping within the specified material depths with respect to finish grade.

2. Final grades shall be accepted by the Engineer before work on this section will be allowed to begin.

D. Field Measurements:

1. Make all necessary measurements in the field to ensure precise fit of items in accordance with the original design. Contractor shall coordinate the installation of all irrigation materials with all other work.
2. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions prior to proceeding with work under this section.
3. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by his operations or neglect.

E. Diagrammatic Intent:

The drawings are essentially diagrammatic. The size and location of equipment and fixtures are drawn to scale where possible. Provide offsets in piping and changes in equipment locations as necessary to conform to structures and to avoid obstructions or conflicts with other work.

F. Layout:

1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads, valves, backflow preventor, and automatic controller.
2. Layout irrigation system and make minor adjustments required due to differences between site and drawings. Where piping is shown on drawings under paved areas, but running parallel and adjacent to planted areas, install the piping in the planted areas.

G. Water Supply

Connections to, or the installation of, the water supply shall be at the locations shown on the drawings. Minor changes caused by actual site conditions shall be made.

H. Electrical Service:

1. Connections to the electrical supply shall be at the locations shown on the drawings. Minor changes caused by actual site conditions shall be made.
2. Contractor shall make 120 volt connection to the irrigation controllers. Electrical power source to controller locations shall be provided by others.

3.2 TRENCHING

A. Excavations shall be straight with vertical sides, even grade, and support pipe continuously on bottom of trench. Trenching excavation shall follow layout indicated on drawings to the depths below finished grade and as noted. Where lines occur under paved area, these dimensions shall be considered below subgrade.

B. Provide minimum cover of 24 inches on pressure supply lines 4 inches and larger. Provide minimum cover of 18 inches on pressure supply lines 3 inches and smaller.

C. Provide minimum cover of 18 inches for control wires.

D. Provide minimum cover of 12 inches for non-pressure lines.

E. Pipes installed in a common trench shall have a 6-inch minimum space between pipes.

3.3 BACKFILLING

A. Backfill material on all lines shall be the same as adjacent soil free of debris, litter, and rocks over 1/2 -inch in diameter.

B. Sand backfill material shall be washed, clean, non-plastic, free from deleterious or foreign matter, symmetrical shaped, natural or manufactured from crushed rock, conforming to the grading requirements of ASTM C 144, with 100% passing a 4.75mm sieve and a maximum silt content of 4%

C. Backfill shall be tamped in 4-inch layers under the pipe and uniformly on both sides for the full width of the trench and the full length of the pipe. Backfill materials shall be sufficiently damp to permit thorough compaction, free of voids. Backfill shall be compacted to dry density equal to adjacent undisturbed soil and shall conform to adjacent grades.

D. Flooding in lieu of tamping is not allowed.

E. Under no circumstances shall truck wheels be used to compact backfill.

F. Provide sand backfill a minimum of 6 inches over and under all piping under paved areas.

3.4 PIPING

A. Piping under existing pavement may be installed by jacking, boring, or hydraulic driving. No hydraulic driving is permitted under asphalt pavement.

B. Cutting or breaking of existing pavement is not permitted, unless specifically indicated on the drawings.

C. Carefully inspect all pipe and fittings before installation, removing dirt, scale, burrs and reaming. Install pipe with all markings up for visual inspection and verification.

D. Remove all dented and damaged pipe sections.

E. All lines shall have a minimum clearance of 6 inches from each other and 12 inches from lines of other trades.

F. Parallel lines shall not be installed directly over each other.

G. In solvent welding, use only the specified primer and solvent cement and make all joints in accordance with the manufacturer’s recommended methods including wiping all excess solvent from each weld. Allow solvent welds at least 15 minutes setup time before moving or handling and 24 hours curing time before filling.

H. PVC pipe shall be installed in a manner which will provide for expansion and contraction as recommended by the pipe manufacturer.

I. Centerload all plastic pipe prior to pressure testing.

J. All threaded plastic-to-plastic connections shall be assembled using Teflon tape.

K. For plastic-to-metal connections, work the metal connections first. Use a non-hardening pipe dope on all threaded plastic-to-metal. All plastic-to-metal connections shall be made with plastic female adapters.

L. All solvent weld mainline piping is to be secured with minimum one cubic foot thrust blocks at all directional changes. Bell and gasket pipe to have a Leemco joint restraint system installed on all fittings in lieu of thrust blocks.

3.5 CONTROLLER

A. The exact location of the controller shall be approved by the Landscape Architect or Owner's authorized representative before installation. The electrical service shall be coordinated with this location.

B. The Irrigation Contractor shall be responsible for the final electrical hook up to the irrigation controller.

C. The irrigation system shall be programmed to operate during the periods of minimal use of the design area or in accordance with the irrigation schedule provided.

3.6 CONTROL WIRING

A. Low voltage control wiring shall occupy the same trench and shall be installed along the same route as the pressure supply lines whenever possible.

B. Where more than one wire is placed in a trench, the wiring shall be taped together in a bundle at intervals of 10 feet. Bundle shall be secured to the mainline with tape at intervals of 20 feet.

C. All connections shall be of an approved type and shall occur in a valve box. Provide an 18-inch service loop at each connection.

D. An expansion loop of 12 inches shall be provided at each wire connection and/or directional change, and one of 24 inches shall be provided at each remote control valve.

E. A continuous run of wire shall be used between a controller and each remote control valve. Under no circumstances shall splices be used without prior approval.

F. Pull boxes for low voltage control wires shall be provided at a spacing of 480 feet on center along the wire route. An expansion loop of 24 inches shall be provided at each control wire pull box.

3.7 VALVES

A. Automatic control valves, manual valves, gate valves, and ball valves are to be installed in the approximate locations indicated on the drawings.

B. Valve shall be installed in shrub areas whenever possible.

C. Install all valves as indicated on the drawings.

D. Valves to be installed in valve boxes shall be installed one valve per box.

3.8 VALVE BOXES

A. Valve boxes shall be installed in shrub areas whenever possible.

B. Each valve box shall be installed on a foundation of 3/4 inch gravel backfill, 3 cubic feet minimum. Valve boxes shall be installed with their tops 1/2 inch above the surface of surrounding finish grade in lawn areas and 2 inches above finish grade in ground cover areas.

3.9 SPRINKLER HEADS

A. Sprinkler heads shall be installed as indicated on the drawings.

B. Spacing of heads shall not exceed maximum indicated on the drawings.

C. Riser nipples shall be of the same size as the riser opening in the sprinkler body.

D. Pop-up sprinkler heads shall not be installed using side outlet openings.

3.10 DRIP IRRIGATION

A. Provide sample layout for one complete drip valve control zone, including all components, dripline and/or emitter spacing for review and approval by Landscape Architect.

B. Thoroughly flush all driplines and distribution tubing prior to installing drip emitters, air relief valves, flush valves and similar components.

C. All drip irrigation shall be installed prior to installation of plant material.

3.11 MISCELLANEOUS EQUIPMENT

A. Install all assemblies specified herein according to the respective detail drawings or specifications, using best standard practices.

B. Quick coupler valves shall be set approximately 12 inches from walks, curbs, header boards, or paved areas where applicable.

C. Unless designed as an integral part of the irrigation head, anti-drain valves will be installed under every head. The anti-drain valve will be the same diameter as the riser and be integral to the riser assembly.

D. Install rain sensors as indicated on the drawings and as recommended by the manufacturer.

3.12 FLUSHING THE SYSTEM

A. Prior to installation of sprinkler nozzles, the valves shall be opened and a full head of water used to flush out the lines and risers.

B. Sprinkler nozzles shall be installed after flushing the system has been completed.

3.13 ADJUSTING THE SYSTEM

A. Contractor shall adjust valves, align heads, and check coverage of each system prior to coverage test.

B. If it is determined by the Landscape Architect or Owner's authorized representative that additional adjustments or nozzle changes will be required to provide proper coverage, all necessary changes or adjustments shall be made prior to any planting.

C. Automatic control valves are to be adjusted so that the sprinkler heads operate at the pressure recommended by the manufacturer.

3.14 TESTING AND OBSERVATION

A. Do not allow or cause any of the work of this section to be covered up or enclosed until it has been observed, tested and accepted by the Landscape Architect, Owner, and/or governing agencies.

B. The Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing.

C. When the sprinkler system is completed, the Contractor shall perform a coverage test of each system in its entirety to determine if the water coverage for the planted areas is complete and adequate in the presence of the Landscape Architect.

D. The Contractor shall furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the plans, or where the system has been willfully installed when it is obviously inadequate, without bringing this to the attention of the Landscape Architect.

E. Final inspection will not commence without completed record drawings as prepared by the Irrigation Contractor.

3.15 MAINTENANCE

A. Maintenance period does not start until all elements of construction, planting, and irrigation for the complete project are in accordance with the contract documents for this project.

B. Request an inspection to begin maintenance period after all landscape elements have been completed in accordance with the contract documents. Maintenance period commences after

date of Substantial Completion as determined by the Landscape Architect and confirmed in written notification by the Owner and continues for a minimum period of 90 days.

C. During the maintenance period the Contractor shall adjust and maintain the irrigation system in a fully operational condition providing complete irrigation coverage to all intended plantings.

3.16 COMPLETION CLEANING

Clean-up shall be made as each portion of the work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed, and any damage sustained on the work of others shall be repaired to original conditions.

END OF SECTION 328400

SECTION 32 9000 - PLANTING

PART 1 – GENERAL

1.1 SUMMARY

A. Provide labor, material, equipment, and appliances necessary to provide trees, plants, and ground cover as indicated on Drawings, specified, and as required for a complete installation.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 012513 - Product Procedures for Substitutions and/or Equal.
3. Section 014524 - Environmental Import/Export Material Testing.
4. Section 312200 - Grading.
5. Section 320190 - Operation & Maintenance of Planting.
6. Section 321313 - Site Concrete Work.
7. Section 328413 - Potable Water Irrigation.

1.2 SUBMITTALS

A. Comply with provisions of Section 013300.

B. Submit complete lists of landscape materials and equipment to be used, including manufacturers name and address, specific trade names, catalog numbers complete with illustrations and descriptive literature and clearly mark or underline proposed items list sources of landscape topsoil.

C. Shop Drawings: Required for any landscape structure.

D. Material List: Plant materials list.

E. Certification: In addition to other required certification, furnish a certificate with each delivery of bulk material, including topsoil, planter mix soil, bark mulch, stating its source, quantity, type of material furnished and that such item or material conforms to requirements of this section.

F. Sample: Submit topsoil Sample and soil amendments with analysis.

G. Fertilizer analysis: Provide labels of each fertilizer used and quantities used at each application recommended in Soil Analysis Report.

H. Soil Test: After completing soil rough grading, have soil tested for fertility and agricultural suitability. Soil shall be tested from minimum of (3-4) locations per acre of planted area.

Provide a sampling map for approval of the OWNER and ARCHITECT prior to field sampling. Agronomy soil testing will show the specific sampling locations, and individual testing will be done for each sampling location. Test results will be provided for the specific sampling locations. Mixed, composite samples of multiple sampling locations is unacceptable. A copy of soil test results shall be submitted to OWNER and ARCHITECT before landscape work begins. Agronomy soil testing report will include any amendments that would be needed to mitigate any soil deficiencies. Pay for cost of soil test.

I. Samples of mineral and / or organic mulch

1.3 QUALITY ASSURANCE

A. Workers: Furnish skilled workers thoroughly trained and experienced in required crafts and familiar with specified requirements for proper performance of Work of this section.

B. Codes and Regulations: Materials, fabrication, and installation in this section shall comply with applicable State Codes and Regulations. Deliver permits and testing certifications to Project Inspector.

C. Quality and Size: Comply with current edition of “Horticultural Standards” for number one nursery stock as adopted by “American Association of Nurserymen”.

D. Plants:

1. True to name, with name of plants in accordance with standards of practice of “American Association of Nurserymen.”
2. Botanical names take precedence over common names.

1.4 GENERAL REQUIREMENTS

A. Project Inspector will verify that irrigation systems are operating before starting Work of this section.

B. Inspection: Notify ARCHITECT at least 72 hours in advance to schedule following inspections:

1. Plant material at time of delivery to Project site.
2. Final location of plants prior to preparation of planting pits.
3. Trees of 24-inch box size and larger at their source before delivery to Project site.
4. Finish grades prior to sodding or seeding areas.
5. Field placement of landscape site features (site furnishings, play equipment. Boulders)
6. Substantial Completion inspection and punch list at completion of landscape installation.
7. Final Substantial Completion inspection prior to start of Maintenance Period.

C. Existing Utilities and Existing Plant Materials:

1. Protect existing utilities and existing plant materials from damage.

a. Perform modifications only as permitted by ARCHITECT, in accordance with applicable provisions noted or specified on Drawings, or in other sections of these Specifications.

2. Replace damaged plant material with like type and size material. ARCHITECT shall determine cost of irreplaceable plant material according to "square inch" method as described by Council of Tree and Landscape Appraisers' "Manual for Plant Appraisers" handbook, Current Edition, and "Guide for Establishing Values of Trees and Other Plants".

D. Verification of Dimensions and Quantities:

1. Verify scaled dimensions and quantities before starting landscaping Work.

2. Promptly notify ARCHITECT of any discrepancies between Drawings, Specifications or actual Project site conditions.

E. Tree Tagging: ARCHITECT may tag 24-inch box and larger trees at nursery. Request tree tagging from ARCHITECT by providing 10 days advance notice. In lieu of personally tagging trees at nurseries, the ARCHITECT reserves the right to ask for photos of trees tagged at the nursery.

F. Pest Management Method and Products:

1. CONTRACTOR shall ensure that plants provided are clean, healthy, free of physical damage, and show no symptoms of abiotic injury. Plants must also be free of diseases, arthropod pests, and any other type of plant pests. Before applying pesticides to plants on OWNER'S property, the following criteria must be met:

a. Individuals who apply pesticides on behalf of CONTRACTOR's company must have a Qualified Applicator License in appropriate category of pest control issued by California Department of Pesticide Regulation and registered to conduct pest control for hire as a business by Los Angeles County Agricultural Commissioner's Office.

b. Products used must be listed on OWNER's approved product list.

c. Length of time from date of use of a pesticide product until beneficial occupancy by OWNER may not be less than five half-lives of products used.

d. Contact OWNER's Pest Management Department at (213) 743-1102 prior to any pesticide application to verify items above.

e. Complete written records of pesticide applications made by a contractor and or their representative on OWNER property, must be provided to OWNER's Pest Management Department within 10 days of applications.

1.5 SUBSTITUTIONS FOR PLANTS NOT AVAILABLE

A. Submit requests for substitutions of plant species, or size to the OAR, for approval, prior to purchasing the proposed substitution. Request for substitution shall be accompanied with a list of nurseries contacted in the search for the required plant and a record of other attempts to locate the required material. Requests shall also include sources of plants found that may be of a smaller or larger size, or a different shape or habit than specified, or plants of the same genus and species but different cultivar

origin, or which may otherwise not meet the requirements of the specifications, but which may be available for substitution.

1.6 DELIVERY, STORAGE AND HANDLING

A. Provide temporary site storage plan as stated herein.

B. Bulk material: Coordinate delivery and storage with OAR and confine materials to neat piles in areas acceptable to OAR. Protect soil and soil stockpiles from wind, rain and washing that can erode soil or separate fines and coarse material, and contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage. Cover stockpiles with plastic sheeting or fabric at the end of each workday.

C. Packaged Materials: Deliver chemicals, fertilizer, and soil conditioner to the Site in original unopened containers showing weight, manufacturer's guaranteed chemical analysis, trademark and conformance with state law, and name of manufacturer. Biological additives shall be protected from extreme cold and heat. All products shall be freshly manufactured and dated for the year in which the products are to be used. Protect materials from deterioration during delivery, and while stored at the Site.

D. Plant Delivery: Exercise care in transporting, handling, loading, and unloading plant material. Cover all plant materials during transport to protect from wind, sun, heat damage, and drying out. Plant materials damaged in any way from transit or unloading shall be removed immediately from the Site and replaced.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: Designated as imported topsoil as specified herein. Soil test will determine suitability of topsoil before installation. Transport topsoil from source to its final position unless stockpiling is specified. Test in compliance with Section 01 4524.

1. Imported Soil:

a. Shall be from a source outside Project site and in compliance with this section.

b. ARCHITECT may make such inspections and perform such tests as deemed necessary to determine material meets all requirements.

c. At least 30 days before scheduled installation, submit proposed source of topsoil and a sample to ARCHITECT. Submit a written request for review, accompanied by a written report stating that proposed source complies with these specifications by a testing laboratory registered by State of California for agricultural soil evaluation.

d. Comply with recommendations of soils testing laboratory and provide any soil amendments necessary to achieve proper nutrient levels to support healthy plant growth.

e. Imported topsoil shall be of a uniform composition and structure, fertile and friable sandy loam soil, and be free of roots, decay, subsoil, clods and stones larger than ¼ inch in greatest dimension, pockets of coarse sand, noxious weeds, sticks, brush and other litter and not be infested with nematodes or other undesirable insects and plant disease organisms. Imported topsoil shall meet following additional requirements:

1) Gradation Limits: Sand – 50 to 80 percent, clay – 20 percent maximum, and silt – 30 percent maximum. Sand, clay and silt gradation limits shall be as defined in ASTM D422.

2) Agricultural Suitability and Fertility: Topsoil shall be fertile and friable garden soil suitable for sustaining and promoting growth of specified plants.

3) Electrical conductivity less than 2.0 milliohms/centimeter or DS/m.

4) Boron content maximum of 1.0 part per million.

B. Fertilizers and Conditioning Materials: Comply with applicable requirements of State of California Agricultural Code:

1. General:

a. Fertilizing materials shall be packaged, first grade, commercial quality products identified as to source, type of material, weight and manufacturer's guaranteed analysis.

b. Fertilizing material shall not contain toxic ingredients and fillers in quantities harmful to animal, human or plant life.

c. Submit a certificate of compliance stating material substantially meets Specifications in accordance with provisions of Article 1.03B.

2. Materials:

a. Bone Meal: Commercial raw bone mean shall be finely ground, steamed dry material with a minimum analysis of 2.5 percent nitrogen and 22 percent phosphoric acid.

b. Gypsum: Hydrated calcium sulfate produce containing 23 percent calcium and 18 percent sulfur with a guarantee analysis of 84 percent calcium sulfate.

c. Soil Sulfur: Guarantee analysis of 99 percent sulfur.

d. Superphosphates: First grade finely ground phosphate rock used for agricultural purpose, containing minimum 18 percent phosphoric acid by volume.

e. Commercial Fertilizer: Pellets or granular product having a chemical analysis of 14-14-14, with a minimum of 68 percent of nitrogen from slow-release nitrogen unless otherwise specified in Soil Analysis Report: it should be a free-flowing material delivered in unopened bags, do not install material which becomes caked or otherwise damaged.

f. Nitrogen Fortified Wood Product: Derived from redwood, fir or cedar sawdust or from bark of fir or pine treated with a non-toxic agent to quickly absorb water and comply with following requirements:

1) Gradation:

SIEVE SIZE	PERCENT PASSING
1/4-inch	95 percent minimum
#8	80 percent minimum
#35	30 percent minimum

Nitrogen Content:

NITROGEN CONTENT	PERCENT DRY WEIGHT
Redwood	0.4 to 0.6 percent
Fir	0.56 to 0.84 percent
Cedar	0.56 to 0.84 percent
Fir Bark	0.8 to 1.2 percent
Pine Bark	0.8 to 1.2 percent

2) Salinity: Maximum saturation extract conductivity 2.5 milliohms/centimeter at 25 degrees Celsius.

3) Absorption: When one teaspoon of water is applied to 4 cubic inches of air-dried products, material shall be become completely damp in a period of less than 2 minutes. Kellogg KRA, Sequoia Redwood/Cedar Blend or White Fir, Long Beach Soil Preparation, Bandini #101 Redwood Soil Builder of nitrogenized wood amendment.

g. Organic Fertilizer: Treated, relatively dry friable organic compost derived from sewage sludge processed for agricultural use; containing at least 1 percent nitrogen by dry weight, 2 percent phosphoric acid and comply substantially with gradation noted in sub-section 2.1, B6. Milorganic, Kellogg's Nitrohumus, or equal.

C. Prepared Backfill mix:

1. To be based upon recommendations from soils test performed by a certified laboratory.

2. Mix (for bidding purposes):

a. Seventy percent by volume clean excavated topsoil/import soil.

b. Thirty percent by volume nitrogen stabilizer wood residual.

c. One pound per cubic yard gypsum.

d. Two pounds fertilizer per cubic yard (14-14-14 with a minimum 68 percent of nitrogen from slow-release nitrogen. Additional secondary and micronutrients preferred).

3. Mix (acid plants)

a. Thirty percent by volume clean excavated soil/imported soil.

b. Seventy percent by volume nitrogen stabilized wood residual.

c. Two pounds per cubic yard. soil sulfur.

d. Two pounds fertilizer per cubic yard (14-14-14 with a minimum 68 percent of nitrogen from slow-release nitrogen. Additional secondary and micronutrients preferred).

D. Plants

1. Tagging Plant Material

a. Attach legible labels to each individual plant or container containing one or more plants. Provide the necessary detailed information as to horticultural name, size, or other data required to identify as conforming to specifications on the label.

b. Refer to American Standards for Nursery Stock regarding labeling of plant material.

c. When the label is attached to a container containing more than one plant, mark quantity as well as other required information on the label. The OAR will reject plant material with illegible or missing tags.

2. Inspection of Plant Material

a. Allow the OAR or ARCHITECT the opportunity to inspect plant material at nursery or off-Site holding area prior to arrival on Site.

b. All plant materials will be inspected by OAR or the ARCHITECT after arrival on Site.

c. Notify the OAR at least 72 hours prior to the proposed arrival of plant materials onsite and submit an itemized list of plants in each delivery.

d. Arrange for adequate labor and equipment onsite at the time of plant material inspection and unload, open, and handle plant material during inspection.

e. Immediately remove plants from the Site that do not meet the requirements specified herein or do not match approved representative photographs.

f. CONTRACTOR shall bear all cost related to plant corrections.

2. Plants stored in standing water will be rejected and shall be removed from the Site.

E. Temporary Storage:

a. Plant all materials within 24 hours of being delivered. If planting is delayed more than 24 hours after delivery, set plants on the ground and protect by covering root ball with soil, wet burlap, or other material acceptable to the OAR. Protect all plant material from freezing, sun, drying winds, and mechanical damage.

b. Irrigate plants as needed until planted.

c. Plants stored under temporary conditions, whether accepted by the OAR or not, are the sole responsibility of the CONTRACTOR.

d. Plants temporarily stored are subject to inspection and approval prior to planting. Immediately remove rejected plant material from the Site.

e. Do not heel in plants for more than 1 week.

f. Do not store fertilizer, lime, or other chemicals (herbicides, pesticides, or other deleterious material) within 50 feet any planting material.

g. Protect packaged materials from deterioration during storage.

h. Do not remove container-grown stock from containers until planting time.

F. Plant Material:

1. Trees: Trees shall conform to type and size noted on Drawings. Unless approved otherwise, trees shall be a minimum of 24" box size. For tree height and caliper dimensions, if specified, measure height from root crown to last division of terminal leader and measure diameter 1 ft. above root crown for caliper. For palm tree trunk height dimension, measure height of palm trees from ground line to base of growing bud. Palms shall stand reasonably erect without support.

2. Shrubs: Specified type and size selected from high quality well shaped nursery stock.

3. Flatted Plants: Grown and remain in flat until transplanted at Project site. Soil and spacing of plants in flat shall insure minimum disturbance of root system at time of transplanting. Maximum plants per flat to be 64 to 100 plants, or as indicated in Drawings.

4. Grass: See Specification Section 329113 for Lawns and Grasses.

G. General Materials:

1. Pipe: Galvanized steel, standard weight (schedule 40) complying with ASTM A120.

2. Nails, fasteners, etc.: Galvanized and commercial quality materials.

3. Fabricated metal items: Steel conforming to ASTM A36.

4. Concrete items: Standard 2000 psi concrete.

H. Concrete headers: 6-inch by 8-inch size, complete with pre-molded expansion joint material 30 ft. apart, and control joints at 10 ft. apart, or as indicated on Drawings. Control joints to be tooled or saw cut to a minimum depth of 1/2".

I. Composite Headers: Headers and stakes shall be composite material sizes as indicated on Drawings. Screws shall be plated deck screws. Stakes shall be 1 inch by 2-inch by 12-inch in length and headers shall be furnished in 2-inch by 6-inch by 20-foot in length and shall be of uniform width and thickness.

J. Tree Stakes: Steel stakes shall be the R2 Stake System (also known as the Reddy Stake System) manufactured by J. R. Partners or equal. Provide two R2 Stakes per tree. Use 7 feet R2 Stake for 15 gallon size trees and smaller and the 9 feet R2 Stake for 24-inch box size trees or smaller. Use the Mega Stake for 36 inches and 48 inches box size trees. If trees are surrounded by steel grates, utilize the Grate Stake for 24-inch box size trees and smaller and the Mega Grate Stake for 36-inch box size trees or smaller.

K. Tree Ties:

1. Wire Type: No. 10 gage BMG galvanized soft steel wire covered with garden hose.

2. Cinch Tie: Flexible vinyl with adjustable interlocking capability.

L. Tree-Root Control Barrier: Shall be fabricated from a high density and high impact plastic such as polyvinyl chloride, ABS or polyethylene, and have a minimum thickness of 0.08 inch. Plastic shall be furnished with ½ inch to ¾ inch high raised vertical ribs on inner surface spaced at least 6 inches but not more than 8 inches apart. Install a plastic root control barrier with each new tree planted within a tree well. Deep Root Corp., or equal.

M. Pest Management Methods and Products: Refer to paragraph 1.04.F for details pertaining to CONTRACTOR applying pesticides.

N. Jute matting shall be of a uniform open plain weave, single jute yarn, not varying in thickness by more than one half its normal diameter. Jute matting shall be furnished in rolled strips as follows: Length, approximately 50 to 75 yards, width, 45 inches to 50 inches. Ludlow Soil Saver No. 48, or equal.

O. Mulches.

1. Organic Mulch: Provide medium grind bard, consisting of organic, fibrous, woody bark mixture of varied particle size such that 90 to 100 percent passes 1 inch sieve, 80 59 100 percent passes 1/2 inch sieve, and 20 59 60 percent passes 1/4 inch sieve, or approved equal. Mulch shall be free of contaminants and weed seed and shall have a pleasant musty or moldy soil-like odor. Putrid, ammonia and sour-smelling materials will be deemed unacceptable. Recycled construction materials not be permitted.

PART 3 – EXECUTION

3.1 EXISTING SURFACE CONDITIONS

A. Examine areas and conditions under which Work of this Section will be performed. Correct detrimental conditions before commencing Work of this section.

3.2 GRADING AND SOIL PREPARATION

A. Initial Rough Grading: Specified in Division 31.

B. Earthwork and Topsoil Placement: Shall include excavation and backfilling for irrigation system and preparation for spreading, densification, cultivation, and raking of topsoil, including fertilization and conditioning.

C. Preliminary Grading: Scarify existing soil to a depth of 6 inches before backfilling with topsoil. During preliminary grading operation, remove stones over 3/4 inch.

D. In Previously Paved Areas: Remove top 6 inches of existing soil and legally dispose of off Project site. Replace with approved imported topsoil to indicated finish grade.

E. Topsoil Preparation and Conditioning:

1. Type and Thickness: Topsoil shall have a minimum depth of 6 inches above subgrade or as indicated on Drawings, whichever is greater.

2. Before installing topsoil, subgrade shall be cleared of weeds, rock ¾ inch and larger and other extraneous materials from designated planting areas to a depth of 6 inches. The tools acceptable for this cleaning process are a Rock Picker by Harley Enterprise, Track Screener by Cherrington, Screen USA Inc. or other tools or machines designed for the purpose. The finished planting bed preparation is subject to the approval of the OAR. OAR shall coordinate with the OWNER's M&O Landscape staff for a site visit and approval prior to plant/lawn installation.

3. Do not process topsoil when it is so wet or dry as to cause excessive compaction or forming of hard clods or dust.

4. Existing soil can be used as topsoil only if it meets the requirements of Article 2.01.A of this section.

F. Fertilizing and Conditioning: Provide planting areas to finish grades, including mounds, before installation of specified fertilizer or soil conditioning materials.

1. Mechanically install following amount of fertilizer or soil conditioning materials at a uniform rate per 1,000 square feet of planting area:

   a. Three cubic yards of nitrogen fortified wood compost.

   b. Two cubic yards of organic fertilizer.

   c. One hundred pounds. of gypsum.

   d. Thirty pounds of commercial fertilizer.

2. Quantities of required materials for planting areas shall be at Project site. Furnish Project Inspector with delivery tickets before installation to verify source, kind, and quantities delivered.

3. After installation of fertilizer and soil conditioning materials, uniformly cultivate materials into upper 6 inches of soil with suitable equipment operated in at least two directions at approximate at right angles. Process soil until friable.

G. Finish Grading:

1. Provide a finish grade, smooth, uniform, and free of abrupt grade changes and depressions to insure proper surface drainage.

2. Finish grades adjacent to paving curbs or headers shall be 1 inch lower in sod areas and 2 inches lower in shrub or ground cover areas.

3. Irrigate soil after installation of fertilizer and soil conditioning materials. Allow soil to settle. Provide a stable surface. After soil has dried out to a workable condition, re-grade, rake, and smooth to required grades and contours. Finished surfaces to be left clean and suitable for planting.

4. Areas to be planted shall be graded and floated to provide complete surface drainage; water holding depressions and pockets shall be eliminated. Undulations and unsightly variations in grade which will not permit the use of normal mowing equipment without scalping or missing shall be removed so that proper use of mowing equipment can be performed.

5. Areas to be planted shall also be finished graded to meet any walks, paths or other adjoining surfaces so that, after compaction, no water pockets or ridges remain.

6. Areas where sod will interface with other modes of planting at catch basins and paved areas shall be finish shaped so as to counter sink the sod one inch such that once sod is placed, it shall be at grade with adjacent planting bed.

H. Contour mounds: Construct with imported topsoil and specified soil amendments. Install and shape mounds to minimize settlement or erosion and to provide adequate footing for placement of boulders. Referenced dimensions of mound contours refer to height above finish grade.

I. Trenching: After completion of soil conditioning or finish grading operations, backfill upper portion of trench so specified topsoil thickness in trench is restored.

J. Weeding: Once site has been cleared, grubbed and rough graded, landscape areas shall be maintained free of vegetation growth until start of irrigation and planting phase of work.

3.3 HEADER INSTALLATION

A. Install at locations and grades shown on Drawings before planting.

3.4 PLANTING

A. General: Planting materials shall be inspected before planting, including those tagged at nursery.

1. Perform planting with material, equipment and according to procedures favorable to optimum growth of plant. Do not plant during windy conditions.

2. Commence planting operations immediately following completion of irrigation system.

B. Layout and Plant Locations:

1. Plant locations indicated on Drawings are approximate.

2. Provide a layout of plants in nursery containers and landscape elements in planting areas and obtain review of ARCHITECT before actual planting operations.

3. Locate first row of plantings in areas designated for on center spacing at one-half the designated spacing from edge of area.

4. Plants may be re-spotted before planting as directed by ARCHITECT.

C. Specimen Planting: Plantings in boxes 24 inches or larger shall be installed before installation of lateral irrigation lines. Re-route irrigation lines in conflict with specimen locations to clear root ball.

D. Tree and Shrub Installation:

1. Excavate planting holes approximately square with vertical sides shall be twice the width of plant container or root ball; larger if necessary to permit handling and installation without damage to root ball system. Bottom of plant container or root ball shall be placed on existing undisturbed soil.

2. Do not install plantings having a broken or cracked root ball.

3. Containers should be opened and removed in such a manner not to damage root system.
4. Remove balled plant wrappings after plant is positioned in hole.
5. Scarify native soil at bottom half of holes to a depth of 6 inches.
6. Backfill bottom half of hole with specified backfill mix minus fertilizers. Settle with water.
7. After water settling bottom half of hole, set planting approximately in center of hole and adjust root flush to finish grade.
8. Backfill balance of hole with specified backfill mix and fertilizer and water settle.
9. Prune or remove any broken or damaged limbs.
10. Form a circular watering basin slightly larger than hole; 4-inch high for trees and 2-inch high for shrubs. Shape bottom of basin to be slightly lower than finish grade.
11. Restore area around plantings to finish grade.
12. After installation, plantings shall be plumb with root crown at its natural depth with respect to finish grade.
13. New trees in grass areas to be installed with tree trunk protector (Arborguard or equal).

E. Backfill Planting Mix: Consists of 70 percent specified topsoil, and 30 percent nitrogen fortified sawdust mulch plus the amendments indicated in soil analysis report.

F. Raised Planter Mix: Backfill mix for raised planters and tree pits in raised planters shall be of following materials.

1. Planter Mix by B.D. White Topsoil Co., Culver City, by AE Schmidt Co, Planter Mix by Gale Materials or equal.
2. Weights shall be 45 pounds per cubic foot.
3. Raised planters shall be backfilled with finish grade at 2 inches below the planter top.
4. Required system for draining planters shall be in place prior to placing backfill.

G. Ground Cover Planting:

1. Complete soil preparation and fine grading before installation of ground cover plantings.
2. Install ground cover in moist soil, spaced as indicated on Drawings.
3. Install each plant with its proportionate amount of flat soil to minimize root disturbance.
4. The degree of soil moisture in flat shall be such that soil does not crumble when removing planting.
5. Following installation of ground cover, restore finish grade to insure proper surface draining.

H. Transplanting of Existing Plant Material: In accordance with current horticulture practices.

1. Box or root system as necessary to maintain plant materials in a healthy, growing condition.
2. Equivalent size and kind of plantings may be provided instead of transplanting an existing planting.

I. Fertilizing: At 30 day intervals after sod or ground cover installation, install an all purpose 15-15-15 commercial fertilizer at rate of 10 pounds per 1,000 square feet of installed area. Thoroughly water area after applying fertilizer. Fertilizer applications shall be performed under observation of Project Inspector.

3.5 PLANTING AREA MULCHING

A. mulch backfilled surfaces of planting areas with 3 inch layer of mulch except slopes that are 2:1 or steeper, hydroseeded areas, turf areas and bioretention basin bottoms.

3.6 CLEAN-UP

A. During installation, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.

B. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the CONTRACTOR from all surfaces within the project or on public right of ways and neighboring property.

C. Once installation is complete, wash all soil from pavements and other structures. Ensure that mulch is confined to planting beds and that all tags and flagging tape are removed from the site.

D. Make all repairs to grades, ruts, and damage due to the work at the site.

E. Remove and dispose of all excess planting soil, subsoil, mulch, plants, packaging, and other material brought to the site by the CONTRACTOR.

3.7 PROTECTION DURING CONSTRUCTION

A. The CONTRACTOR shall protect planting and related work and other site work from damage due to planting operations, operations by other Contractors or trespassers. Maintain protection during installation until Substantial Completion Acceptance. Treat, repair or replace damaged work immediately.

B. Damage done by the CONTRACTOR, or any of their sub-contractors to existing or installed plants, or any other parts of the work or existing features to remain, including roots, trunk or branches of large existing trees, soil, paving, utilities, lighting, irrigation, other finished work and surfaces including those on adjacent property, shall be cleaned, repaired or replaced by the CONTRACTOR at no expense to the OWNER. The OAR shall determine when such cleaning, replacement or repair is satisfactory.

C. Do not store materials or equipment, permit burning, or operate or park equipment

under the branches or on the root ones of existing plants to remain. CONTRACTOR must report and repair, per the Specifications, any damage to plants and structures to the OAR.

D. Damage to existing trees shall be assessed by a certified arborist.

3.8 INSPECTIONS

A. Inspections by the Landscape Architect shall occur at various milestones throughout the Contract. Notify the OAR 72 hours prior to request inspection dates.

B. The following inspections will occur:

a. When plant material arrives on site, prior to planting.

b. When plant material is laid out in accordance with Contract Drawings and prior to planting.

c. When work is ready for review for Landscape Substantial Completion.

d. After punch list items are completed and are ready for Final Acceptance after Landscape Substantial Completion.

e. At the conclusion of the Warranty Period.

C. The Landscape Architect will provide inspection field reports.

3.9 OBSERVATION OF THE WORK

A. The ARCHITECT and OAR may observe the work at any time. They may remove samples of materials for conformity to specifications. Rejected materials shall be immediately removed from the site and replaced at the CONTRACTOR 's expense. The cost of testing materials not meeting specifications shall be paid by the CONTRACTOR.

B. The OAR shall be informed of the progress of the work so the work may be observed at the following key times in the construction process. The OAR shall be afforded sufficient time to schedule visits to the site. Failure of the OAR to make field observations shall not relieve the CONTRACTOR from meeting all the requirements of this specification.

1. Completion of the plant layout staking: Review of the plant layout.

2. Plant quality: Review of plant quality at the time of delivery and prior to installation. Review tree quality prior to unloading where possible, but in all cases prior to planting.

3. Completion of the planting: Review the completed planting.

3.10 MAINTENANCE DURING PROJECT INSTALLATION

A. After installation of the irrigation system, and during installation of plant materials and grass, provide maintenance for all plantings and grass to keep the plants in a healthy state and the planting areas and lawns clean and neat.

B. Required: Maintain areas on a continuous basis as they are completed during progress of Work.

Maintenance shall include continuous operations of watering, mowing grass, weeding, trimming, rodent control, reseeding, planting replacement irrespective of cause or any other operations necessary to assure normal plant growth.

C. Keep planting areas and grass lawns free of debris and weeds. Clean and cultivate at intervals not to exceed 7 days.

D. General requirements:

1. All work shall be undertaken by trained planting crews under the supervision of a foreman with a minimum of 5 years' experience supervising commercial plant maintenance crews.

2. All fertilizer applications shall be made by licensed applicators within the State of California for the type of fertilizer to be used. All work shall comply with all applicable local, state, and federal requirements and be approved by the OWNER following the Integrated Pest Management Plan (IPM).

E. Provide the following ongoing maintenance tasks:

1. Watering; Provide all water required to keep soil within and around the plant root balls, and at lawns, at optimum moisture content for plant growth.

2. Monitor soil moisture to provide sufficient water. Check grass soil moisture and root ball moisture with a soil moisture meter on a regular basis and record moisture readings. Do not over water.

3. Plant pest control: Maintain disease, insects and other pests at manageable levels. Manageable levels shall be defined as damage to plants that may be noticeable to a professional but not to the average person. Use least invasive methods to control plant disease and insect outbreaks. The OAR must approve in advance the use of all chemical pesticide applications.

4. Plant replacement: Replace all plants that are defective as defined in the warranty provisions, as soon as the plant decline is obvious and in suitable weather and season for planting as outlined in above sections. Plants that become defective during the installation or maintenance period shall be covered and replaced under the warranty provisions.

5. Perform first mowing of grass areas when grass is 2 1/2 inches high and repeat as often as is necessary to maintain sod at a height of 2 inches. In no case shall sod be cut lower then 1 1/2 inches in height unless otherwise directed.

6. See spec Section 320190 - Maintenance & Operations of Planting.

3.11 PESTICIDE APPLICATION

A. Comply with requirements outlined in paragraph 1.04.F.

3.12 PROTECTION

A. Unless noted otherwise, protect Work of this section until Substantial Completion.

3.13 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

END OF SECTION 329000

SECTION 33 41 00 – STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes gravity-flow, nonpressure storm drainage pipe and drainage structures outside the building.

1.2 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 8-foot head of water (3.5 psi).

1.3 SUBMITTALS

A. Product Data: For each type of product installed.

B. Field quality-control test reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include but are not limited to, manufacturers specified.

2.2 PVC PIPE AND FITTINGS

A. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

B. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T-1 wall thickness, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

2.3 NONPRESSURE-TYPE PIPE COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Shielded Flexible Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Ring-Type Flexible Couplings: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.4 CLEANOUTS

A. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.5 CONCRETE

A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.
5. Ballast and Pipe Supports: Portland cement design mix, 3,000 pounds per square inch (psi) minimum, with 0.58 maximum water-cementitious materials ratio.

    a. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
    b. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.6 CATCH BASINS

A. Standard Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

1. Base Section: Six-inch minimum thickness for floor slab and four-inch minimum thickness for walls and base riser section and having separate base slab or base section with integral floor.
2. Top Section: Eccentric-cone type unless flat-slab-top type is indicated.
3. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16 (heavy traffic) structural loading unless otherwise indicated. Include 24-inch ID by seven- to nine-inch riser with four-inch minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Pipe couplings and fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping, unless otherwise indicated.

a. Shielded flexible couplings for same or minor difference OD pipes.
b. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.2 PIPING INSTALLATION

A. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cement, and other installation requirements.

B. Install manholes for changes in direction if shown on plan, otherwise use fittings. Use fittings for branch connections unless direct tap into existing storm drain is indicated.

C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of one percent, unless otherwise indicated.
2. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
3. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

E. Clear interior of piping and manholes of dirt and superfluous material as work progresses.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-gasket joints.
2. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 CATCH BASIN INSTALLATION

A. Set frames and grates to elevations indicated.

3.5 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus six-inch overlap, with not less than six inches of concrete with 28-day compressive strength of 3,250 pounds per square inch (psi).

3.6 FIELD QUALITY CONTROL

A. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Clean the pipe and remove debris and sediments before starting testing.
3. Test completed piping systems according to requirements of authorities having jurisdiction.
4. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.
5. Replace leaking pipes that failed the test and repeat the test until a satisfactory pass is achieved.
6. Submit separate reports for each test.

B. Hydrostatic Tests: Test sanitary sewer according to requirements of authorities having jurisdiction or the following procedures for Concrete, PVC, HDPE, ABS, DI, and CI pipes:

a. Close openings in system and fill with water.
b. Purge air and refill with water.
c. Allow water level to stabilize for a minimum of 1 hour before starting the test, add water as needed.
d. Minimum head: At least 2 feet above the crown (top) of the highest section of the pipe in the line under test.
e. Disconnect water supply.
f. Test and inspect joints for leaks.
g. Acceptable leakage shall not exceed 50 gallons/inch of nominal pipe size per mile of pipe, during 24-hour period. The test period must be at least 1 hour in duration.

Minimum Test Time for Pressure Drop

Nominal pipe diameter (in)	Time for pressure drop (minutes/100 ft)
6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6
27	4.2
30	4.8

C. Air Tests: Test sanitary sewer according to requirements of authorities having jurisdiction or the following procedures for Concrete, PVC, HDPE, ABS, DI, and CI pipes:

a. Do not use low-pressure air test for pipes over 30” in diameter regardless of pipe material.
b. Perform the test immediately following pipe cleaning.
c. Use pneumatic or mechanical test plugs designed specifically for pipeline testing to prevent release of air during low-pressure air test.
d. Start the test after the pressure is stabilized at or above an internal pressure of 3.5 psi.
e. Start recording the time when the internal pressure drops to 3.5 psi. The tested portion of the pipe passes the test when the pressure drop is than 1 psi for the time calculated for the size and length of the pipe to be tested as shown in the following table:

END OF SECTION 33 41 00

SECTION 33 46 00 - SUBDRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes subdrainage systems for under slab areas, retaining walls, and other subdrainage systems.

1.2 SUBMITTALS

A. Product Data: For perforated pipe, fitting and drainage panel.

PART 2 - PRODUCTS

2.1 PERFORATED-WALL PIPES AND FITTINGS

1. Perforated plastic pipe shall be smooth-wall polyvinyl chloride plastic pipe.

   a. Smooth-wall polyvinyl chloride plastic pipe shall conform to the requirements in AASHTO Designation: M 278.

2.2 PERFORATIONS

A. Perforations per ASTM F 758, section 7.2.4. and Table 5.

1. NPS 6 and 8: 4 rows of perforations.

2.3 FITTINGS

A. Polyvinyl chloride pipe shall be connected with belled ends, or with sleeve-type or stop-type couplings conforming to the requirements in AASHTO Designation: M 278. Polyethylene tubing shall be connected with snap-on, screw-on, or wrap-around fittings and couplings conforming to the requirements of AASHTO Designation: M 252 or M 294. Solvent cementing of joints will not be required.

2.4 SPECIAL PIPE COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant metal tension band and tightening mechanism on each end.

1. Unshielded Flexible Couplings: Elastomeric sleeve with corrosion-resistant metal tension band and tightening mechanism on each end.

2.5 SOIL MATERIALS

A. Backfill, drainage course, impervious fill, and satisfactory soil materials are specified in Division 2 Section "Earthwork."

2.6 GEOTEXTILE FILTER FABRICS

A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.

1. Structure Type: Nonwoven, needle-punched continuous filament or woven, monofilament or multifilament.
2. Style(s): Flat and sock.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 PIPING APPLICATIONS

A. Underground Subdrainage Piping:

1. Perforated PE pipe and fittings, couplings, and coupled joints.
2. Perforated PVC sewer pipe and fittings for loose, bell-and-spigot joints.

B. Underslab Subdrainage Piping:

1. Perforated PE pipe and fittings, couplings, and coupled joints.
2. Perforated PVC sewer pipe and fittings and loose, bell-and-spigot joints.

C. Header Piping:

1. PE drainage tubing and fittings, couplings, and coupled joints.
2. PVC sewer pipe and fittings, couplings, and coupled joints.

3.3 FOUNDATION DRAINAGE INSTALLATION

A. Install vertical drainage panels per manufacturer’s installation instruction and details or as follows:

1. Coordinate placement with other drainage materials.
2. Separate 4 inches of fabric at beginning of roll and cut away 4 inches of core. Wrap fabric around end of remaining core.
3. Attach panel to wall at horizontal mark and at beginning of pipe. Place core side of panel against wall. Use concrete nails with washers through product cylinders to attach panel to wall. Place nails from 2 to 6 inches below top of panel, approximately 48 inches apart. Construction adhesives, metal stickpins, or double-sided tape may be used instead of nails. Do not penetrate waterproofing. Before using adhesives, discuss with waterproofing manufacturer.
4. If additional panels are required on same row, cut away 4 inches of installed panel core, install new panel against installed panel, and overlap new panel with installed panel fabric.
5. If additional rows of panels are required, overlap lower panel with 4 inches of fabric.
6. Cut panel as necessary to keep top 12 inches below finish grade.
7. For inside corners, bend panel. For outside corners, cut core to provide 3 inches for overlap.

B. Place initial backfill material over compacted drainage course. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Final backfill to finish elevations and slope away from building.

3.4 PIPING INSTALLATION

A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.

1. Foundation Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 36 inches, unless otherwise indicated.
2. Underslab Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent.
3. Lay perforated pipe with perforations down.
4. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.

B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

C. Install PE piping according to ASTM D 2321.

D. Install PVC piping according to ASTM D 2321.

3.5 PIPE JOINT CONSTRUCTION

A. Join PE pipe, tubing, and fittings with couplings for soil-tight joints according to AASHTO's "Standard Specifications for Highway Bridges," Division II, Section 26.4.2.4, "Joint Properties."

B. Join perforated, PE pipe and fittings with couplings for soil-tight joints according to AASHTO's "Standard Specifications for Highway Bridges," Division II, Section 26.4.2.4, "Joint Properties"; or according to ASTM D 2321.

C. Join PVC pipe and fittings according to ASTM D 3034 with elastomeric seal gaskets according to ASTM D 2321.

D. Join perforated PVC pipe and fittings according to ASTM D 2729, with loose bell-and-spigot joints.

E. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

3.6 CONNECTIONS

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

B. Connect low elevations of subdrainage system to building's solid-wall-piping storm drainage system.

C. Where required, connect low elevations of foundation and underslab subdrainage to stormwater sump pumps.

3.7 FIELD QUALITY CONTROL.

A. Testing: After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

3.8 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 33 46 00