Rosemead Unified School District

Mildred B. Janson Elementary School

8628 Marshall Street, Rosemead, CA 91770

DSA file No. 19-91

DSA Application No. 03-123590

TECHNICAL SPECIFICATIONS

Portable and Outdoor Classroom

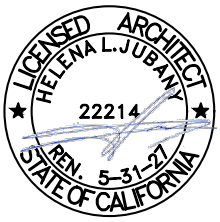
NAC | Architecture

Architect's Job No.

161-23078

BID Set 02/27/2026

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SECTION 01000
ABBREVIATIONS, SYMBOLS AND ACRONYMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. List of abbreviations, symbols, and acronyms of societies, institutes, and associations generally appearing in the Contract Documents.

1.02.1 RELATED SECTIONS

A. Division 01: General Requirements

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 ABBREVIATIONS

ac	Alternating current
amp	ampere
BTU	British thermal unit
cfh	Cubic feet per hour
cfm	Cubic feet per minute
cm	Centimeter
Co.	Company
COP	Coefficient of performance
Corp.	Corporation
d	Penny
db.	Decibel
DB	Dry bulb
dc	Direct current
EER	Energy efficiency ratio
F	Degrees Fahrenheit
fpm	Feet per minute
ft	Foot or feet
gph	Gallons per hour
gpm	Gallons per minute
HP	Horsepower
HVAC	Heating, ventilating and air conditioning
Hz	Hertz
Inc.	Incorporated
KHz	Kilohertz
Kip	thousand pounds
Ksf	Thousand pounds per square foot
Ksi	Thousand pounds per square inch
Kv	Kilovolt

KVA	Kilovolt amperes
KW	Kilowatt
KWH	Kilowatt hour
LF	Linear foot
lb	Pound
LED	Light emitting diode
MBH	1000 BTUs per hour
MHz	Mega hertz
mil	Thousandth of an inch
mm	Millimeter
mph	Miles per hour
oz.	Ounce
PCF	Pounds per cubic foot
pH	Acidity-alkalinity balance
psf	Pounds per square foot
psi	Pounds per square inch
psig	Pounds per square inch, gage
RF	Radio frequency
rpm	Revolutions per minute
SF	Square foot
SY	Square yard
V	Volt
WB	Wet bulb

3.02 SYMBOLS

#	Number or pound
'	Foot or feet
"	Inch(es)
%	Percent

3.03 ACRONYMS

AA	The Aluminum Association, Inc
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ABMA	American Boiler Manufacturers Association
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
AGA	American Gas Association
AGCIH	American Conference of Governmental Industrial Hygienists
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction

AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association, Inc.
ANSI	American National Standards Institute
APA	APA – The Engineered Wood Association
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATBCB	Architectural & Transportation Barriers Compliance Board
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America
CAL/OSHA	California Occupational Safety and Health Administration
CBC	California Building Code
CCR	California Code of Regulations
CEC	California Electrical Code
CFR	Code of Federal Regulations
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CMC	California Mechanical Code
CQC	California Quality Control (CMA Standards)
CPC	California Plumbing Code
CRA	California Redwood Association
CRI	Carpet and Rug Institute
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards, U.S. Department of Commerce
CSFM	California State Fire Marshal
CSI	Construction Specifications Institute
CTIOA	Ceramic Tile Institute of America
CTI	Cooling Tower Institute
DHI	Door and Hardware Institute
DSA	Division of the State Architect
EPA	Environmental Protection Agency
ETL	ETL Testing Laboratories
FCC	Federal Communication Commission
FM	Factory Mutual
FS	Federal Specifications

GA	Gypsum Association
GANA	Glass Association of North America
HMMA	Hollow Metal Manufacturer's Association
HPVA	Hardwood Plywood & Veneer Association
IACS	International Annealed Copper Standards
IAMPO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical & Electronic Engineers, Inc.
IES	Illuminating Engineering Society
IMI	International Masonry Institute
IRI	Industrial Risk Insurers
ISO	International Organization for Standardization
MLSFA	Metal Lath/Steel Framing Association
MSS	Manufacturers Standardization Society of the Valve & Fittings Industry.
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEBB	National Environmental Balancing Bureau
NEMA	National Electrical Manufacturers Association
NEC	National Electrical Code
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NOFMA	National Oak Flooring Manufacturers Association
NPCA	National Paint and Coatings Association
NPDES	National Pollutant Discharge Elimination System
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NTMA	National Terrazzo & Mosaic Association
NUSIG	National Uniform Seismic Installation Guidelines
NWMA	National Woodwork Manufacturers Association
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
PEI	Porcelain Enamel Institute
PS	Product Standard, U.S. Department of Commerce
RIS	Redwood Inspection Service
RFCI	Resilient Floor Covering Institute

SCAQMD	South Coast Air Quality Management District
SDEI	Steel Deck Institute
SDI	Steel Door Institute
SFM	State Fire Marshal
SFPA	Southern Forest Products Association
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Steel Structures Painting Council
SWI	Steel Window Institute
TCA	Tile Council of America
UBPPA	Uni-Bell PVC Pipe Association
UCI	Uniform Construction Index
UFAS	Uniform Federal Accessibility Standards
UL	Underwriters' Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WDMA	Window and Door Manufacturers Association
WIC	Woodwork Institute of California
WWPA	Western Wood Products Association

END OF SECTION

SECTION 01005
SUMMARY OF THE WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The furnishing of all labor, materials, equipment, services, and incidentals necessary for Work to be performed. Work includes but is not limited to the construction of 1 new portable building, site work related to outdoor classroom/ sunken classroom/ garden, new fire hydrant, Fire Lane/ drive Lane, accessible parking, accessible passenger drop-off, associated Path of Travel scope and new ADA signage at existing staff restrooms.

1.02 RELATED SECTIONS

A. Section 01100: Coordination

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 USE OF PREMISES

A. CONTRACTOR shall coordinate the Work of all trades, with OWNER and/or Separate Work Contract. CONTRACTOR shall sequence, coordinate, and perform the Work to impose minimum hardship on the operation and use of the existing facilities and/or Project site. CONTRACTOR shall install all necessary protection for existing improvements, Project site, property, and new Work against dust, dirt, weather, damage, vandalism, and maintain and relocate all protection to accommodate progression of the Work.

B. CONTRACTOR shall confine entrance and exiting to the Project site and/or facilities to routes designated by the OAR

C. Within existing facilities, OWNER will remove specific items from Work areas prior to the start of Work. CONTRACTOR shall remove remaining items in areas of the Work

D. CONTRACTOR shall utilize all available means to prevent generation of unnecessary noise and maintain noise levels to a minimum. When required by the OAR,, CONTRACTOR shall immediately discontinue noise-generating activities and/or provide alternative methods to minimize noise generation. CONTRACTOR shall install and maintain air compressors, vehicles, and other internal combustion engine equipment with mufflers, including unloading cycle of compressors. CONTRACTOR shall discontinue operation of equipment producing objectionable noise as required by the OAR.

E. CONTRACTOR shall furnish, install, and maintain adequate supports, shoring, and bracing to preserve structural integrity and prevent collapse of existing improvements and/or Work modified and/or altered as part of the Work.

F. CONTRACTOR shall secure building entrances, exits, and Work areas with locking devices as required by the OAR.

G. CONTRACTOR assumes custody and control of OWNER property, both fixed and portable, remaining in existing facilities vacated during the Work.

H. CONTRACTOR shall cover and protect surfaces of spaces in existing facilities turned over for the Work, including OWNER property remaining within as required to prevent soiling or damage from dust, dirt, water, and/or fumes. CONTRACTOR shall protect areas adjacent to the Work in a similar manner. Prior to OWNER occupancy, CONTRACTOR shall clean all surfaces including OWNER property.

I. CONTRACTOR shall not use or allow anyone other than OWNER employees to use facility telephones and/or other equipment, except in an emergency. CONTRACTOR shall reimburse OWNER for telephone toll charges originating from the facility except those arising from emergencies or use by OWNER employees.

J. CONTRACTOR shall protect all surfaces, coverings, materials, and finished Work from damage. Mobile equipment shall be provided with pneumatic tires.

K. CONTRACTOR is advised OWNER will award Separate Work Contracts at this Project site.

L. CONTRACTOR shall not permit the use of portable and/or fixed radio's or other types of sound producing devices including other similar devices.

3.02 PROPERTY INVENTORY

A. Property, OWNER intends to remove, will be removed by OWNER before a space is vacated for the Work. Before performing Work in each space, OAR and CONTRACTOR shall prepare a detailed initial written inventory of OWNER property remaining within, including equipment and the condition thereof. OAR and CONTRACTOR shall retain a signed copy of the inventory dated and signed by both parties. Prior to subsequent OWNER occupancy of each such room or space, OAR and CONTRACTOR shall perform a final inventory of OWNER property and all discrepancies between the initial inventory and final inventory shall be the responsibility of CONTRACTOR.

3.03 FURNITURE, FIXTURES, AND EQUIPMENT

A. If designated in the Contract Documents to be OWNER furnished CONTRACTOR installed (OFCI), CONTRACTOR shall unload, store, uncrate,

assemble, install, and connect OWNER supplied furniture, fixtures, and equipment.

B. CONTRACTOR shall, within ten (10) days after delivery, uncrate and/or unpack equipment in presence of IOR who shall inspect the delivered items. IOR shall prepare an inspection report listing damaged or missing parts and accessories. IOR shall transmit one copy of the report to OAR and CONTRACTOR. OWNER will procure and/or replace missing and or damaged furniture, fixtures, and equipment.

C. CONTRACTOR shall install equipment in the locations and orientation. CONTRACTOR shall verify exact locations with OAR prior to final installation of equipment.

D. If required, OAR will furnish setting and or placement drawings for equipment.

E. CONTRACTOR shall install equipment by proper means and methods to ensure an installation as recommended by the manufacturer. CONTRACTOR shall furnish and install all necessary fasteners and required blocking to properly install equipment.

F. CONTRACTOR shall install furniture, fixtures, and equipment with manufacturer recommended fasteners for the type of construction the furniture, fixtures, and equipment is being fastened and/or anchored to.

G. CONTACTOR shall provide final connections of any electrical to the equipment. CONTRACTOR shall, prior to final connection, verify the operating characteristics of equipment are consistent with the designated supply.

END OF SECTION

SECTION 01050
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Procedure for submission of a certified Schedule of Values for review and approval by the OAR.

1.02 RELATED SECTIONS

A. Section 01080: Application for Payment
B. Section 01300: Submittals
C. Section 01365: Construction Schedule

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 PREPARATION

A. Upon receipt of the Notice of Intent to Award, CONTRACTOR shall commence preparation of a certified Schedule of Values.

B. CONTRACTOR shall coordinate the preparation of a certified Schedule of Values with preparation of the Construction Schedule as set forth in Section 01365.

C. CONTRACTOR shall follow the table of contents as a Project specific guide to establish the format for a certified Schedule of Values. Provide at least one (1) line item for each Division and/or Specification Section item. Provide separate line items for labor and material when required by the OAR.

D. Include the following Project school(s) identification on each certified Schedule of Values:

1. Project name and location
2. Project Number
3. ARCHITECT name
4. CONTRACTOR name
5. Date of Submittal

E. Round amounts to the nearest whole dollar; the total shall equal the Contract Amount.

F. An approved certified Schedule of Values shall serve as the basis for the monthly certified Application for Payment.

3.02 90 DAY INTERIM SCHEDULE OF VALUES

A. CONTRACTOR may prepare and submit, in accordance with sub-section 3.03, a 90 day interim Schedule of Values denoting Work to be completed during the first 90 days following the date established in the Notice to Proceed.

B. CONTRACTOR shall coordinate the preparation of the 90 day interim Schedule of Values with preparation of the Construction Schedule as set forth in Section 01360.

C. The 90 day interim Schedule of Values is subject to the same terms and conditions as set forth in sub-section 3.03.

D. The 90 day interim Schedule of Values shall be incorporated into a final Schedule of Values.

E. The OAR has the right to require subsequent revisions to an approved 90 day interim and/or a final Schedule of Values.

3.03 SUBMITTAL

A. Within ten (10) days after the date established in the Notice to Proceed, CONTRACTOR shall submit five (5) certified copies of an interim and/or final Schedule of Values for review and approval by the OAR.

B. OAR will review and if necessary, return the submitted Schedule of Values with summary comments noting items not in compliance with the requirements of the Contract Documents. CONTRACTOR shall revise the submitted Schedule of Values and return five (5) copies within three (3) days of receipt of summary comments.

C. Signature by OAR shall constitute acceptance of the submitted Schedule of Values.

D. A copy of the approved Schedule of Values will be transmitted to CONTRACTOR, IOR, and ARCHITECT.

E. CONTRACTOR shall obtain OAR approval of a 90 day interim Schedule of Values prior to submittal of the first certified Application for Payment.

F. CONTRACTOR shall obtain OAR approval of the final Schedule of Values prior to submittal of the fourth certified Application for Payment.

END OF SECTION

SECTION 01080
APPLICATION FOR PAYMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. This Section specifies administrative and procedural requirements relative to a certified Application for Payment.

1. Coordinate the certified Schedule of Values and certified Application for Payment with, but not limited to, the Construction Schedule, submittal log, and list of Subcontractors.

1.02 RELATED SECTIONS:

1. Section 01050: Schedule of Values
2. Section 01365: Construction Schedule
3. Section 01700: Contract Closeout

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 APPLICATION FOR PAYMENT

A. Each certified Application for Payment shall be consistent with previous applications and payments as reviewed by ARCHITECT and/or OAR, paid for by OWNER, and:

1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

B. Payment Application Times: The period of Work covered by each Application for Payment is the payment date for each progress payment as specified in the General Conditions. The period covered by each Application for Payment is the previous month.

C. Payment Application Forms: Use OWNER provided forms for the Application for Payment.

D. Application Preparation: Complete every entry on the form. Include execution by a person authorized to sign legal documents on behalf of CONTRACTOR. ARCHITECT will return incomplete applications without action.

E. Transmittal: Submit a minimum of four (4) signed and original copies of each certified Application for Payment to the ARCHITECT. All copies shall be complete, including releases and similar attachments.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to ARCHITECT.

F. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal for the first certified Application for Payment include, but are not limited to, the following:

1. Certified Schedule of Values
2. Performance and payment bonds. List of principal suppliers and fabricators.
3. Worker Compensation certificates, if applicable.
4. Auto Insurance, if applicable.
5. Hazardous Material Insurance Certificates, if applicable.
6. Construction Schedule
7. Submittal Schedule
8. Emergency Contact List
9. Copies of authorizations and licenses from governing authorities for performance of the Work

G. Application for Payment at Substantial Completion: Following OAR issuance of the certificate of Substantial Completion, submit an Application for Payment:

1. Administrative actions, submittals and/or Work that shall precede or coincide with this application include:

a. Occupancy permits and similar approvals by authorities having legal jurisdiction over the Work.
b. Removal of temporary facilities and services.
c. Removal of surplus materials, rubbish, and similar elements.
d. OWNER training and orientations.
e. Change over information related to OWNER occupancy, use, operation, and maintenance.
f. Final cleaning.
g. Ensure that incomplete Work is not accepted and will be completed without undue delay.
h. Advice on shifting insurance coverage.

i. List of defective Work, recognized as exceptions to certificate of Substantial Completion.
j. Change of door locks to OWNER system.

H. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include, but are not limited to, the following:

1. Completion of Contract Closeout requirements.
2. Project record documents.
3. Completion of final punch list items.
4. Delivery of extra materials, products and or stock.
5. Identification of unsettled claims.
6. Proof that taxes, fees, and similar obligations are paid.
7. Operating and maintenance instruction manuals.
8. Consent of surety to final payment.
9. Waivers and releases.
10. Warranties, guarantees and maintenance agreements.

END OF SECTION

SECTION 01100
COORDINATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements necessary for coordinating Work operations including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.

PART 2 – PRODUCTS (NONE)

PART 3 - EXECUTION

3.01 COORDINATION

A. CONTRACTOR shall coordinate operations included in various sections of the Contract Documents to assure efficient and orderly installation of each part of the Work. Coordinate Work operations included under related sections of the Contract Documents that depend on each other for proper installation, connection, and operation of the Work, including but not limited to:

1. Schedule construction operations in the sequence required 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 to assure maximum accessibility for required maintenance, service, and repair.

3. Provide provisions to accommodate items scheduled for later installation.

4. Prepare and administer provisions for coordination drawings.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required in notices, reports, attendance at meetings, and:

1. Prepare similar memoranda for OAR and Separate Work Contract where coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Installation, relocation, and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.

D. Conservation: Coordinate Work operations to assure operations are carried out with consideration given to conservation of energy, water, materials, and:

1. Salvage materials and equipment involved in performance of, but not actually incorporated into the Work.

3.02 SUBMITTALS

A. Coordination Drawings: CONTRACTOR shall prepare coordination drawings for coordination of installation of landscape scope. Prepare coordination drawings for those areas where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. All coordination meetings will be held in the Project field office of CONTRACTOR. CONTRACTOR is required to distribute Shop Drawings, cut sheets and submittals to Subcontractors where appropriate. Reviewed coordination drawings will be maintained in the Project field office of CONTRACTOR.

END OF SECTION

SECTION 01120
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements for cutting and patching.

1.02 RELATED SECTIONS

A. Section 01050: Schedule of Values
B. Section 01100: Coordination
C. Section 01300: Submittals
D. Section 01740: Warranties

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 SUBMITTALS

A. The word “cutting” as used in the Contract Documents includes, but is not limited to, cutting, drilling, chopping, and other similar operations and the word “patching” includes, but is not limited to, patching, rebuilding, reinforcing, repairing, refurbishing, restoring, replacing, or other similar operations.

B. Cutting and Patching Proposal: CONTRACTOR shall submit a proposal describing procedures well in advance of the time cutting and patching will be performed if the Contract Documents requires approval of these procedures before proceeding. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required. Denote how it will be performed and indicate why it cannot be avoided.

2. Describe anticipated results in terms of changes to existing construction. Include changes to the building’s appearance or other significant visual elements.

3. List products to be used and firms or entities that will perform this Work.

4. Indicate dates when cutting and patching will be performed.

5. Utilities: List utilities that cutting and patching operations will disturb or affect. List utilities to be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

6. Where cutting and patching involves adding reinforcement to structural elements, submit an RFI for resolution by the AOR.

7. Review by ARCHITECT prior to proceeding with cutting and patching does not waive ARCHITECT right to later require complete removal and replacement of defective Work.

3.02 QUALITY ASSURANCE

A. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.

1. Obtain review of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
   a. Primary operational systems and equipment
   b. Water, moisture, or vapor barriers
   c. Membranes and flashings
   d. Fire protection systems
   e. Noise and vibration control elements and systems
   f. Control systems
   g. Communication and/or data systems
   h. Electrical wiring systems

B. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the opinion of ARCHITECT, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

1. If possible, retain the original installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original installer or fabricator, engage another recognized experienced and specialized firm.
   a. Firestopping
   b. Masonry (exterior and interior where exposed)

3.03 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

3.04 INSPECTION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

1. Before proceeding, meet at the Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.05 PREPARATION

A. Temporary support: Provide adequate temporary support of existing improvements or Work to be cut.

B. Protection: Protect existing improvements and Work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of existing improvements or Work that might be exposed during cutting and patching operations.

C. Avoid interference with operation of adjoining areas or interruption of free passage to adjoining areas.

3.06 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay. Verify compatibility and suitability of existing substrates before starting the Work.

B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining Work.

1. In general, where cutting, provide hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine, such as a carborundum saw or a diamond-core drill. Saw cut reinforcing bars and paint ends with bituminous paint except where bonded into new concrete or masonry.

4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating, backfill, or re-compaction.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with required tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation. Verify conditions of existing substrates prior to executing Work.

2. Restore exposed finishes of patched areas and extend finish restoration into retaining adjoining construction in a manner that will eliminate all evidence of patching and refinishing.

3.07 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged coverings to their original condition.

END OF SECTION

SECTION 01160
REQUEST FOR CLARIFICATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Procedure for requesting clarification of the intent of the Contract Documents.

1.02 RELATED SECTIONS

A. Section 01005: Summary of the Work
B. Section 01100: Coordination
C. Section 01365: Construction Schedule
D. Section 01700: Contract Closeout

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 PROCEDURE

A. ARCHITECT response is a clarification of the intent of the Contract Documents and does not authorize changes in the Contract Amount, Milestones and/or Contract Time.

B. A Request for Clarification may be returned with a stamp or notation "Not Reviewed," if:

1. The requested clarification is ambiguous or unclear;

2. The requested clarification is equally available to the requesting party by researching and/or examining the Contract Documents;

3. CONTRACTOR has not reviewed the Request for Clarification prior to submittal.

C. Allow a minimum of nine (8) days for review and response time, after receipt by ARCHITECT and OAR. CONTRACTOR shall verify and is responsible in verifying ARCHITECT and OAR receipt of a Request for Clarification.

D. Changes or alterations to the approved drawings or specifications shall be made by means of addenda or change orders as per section 4-338 of the California Building Standards Administrative Code and approved by DSA.

END OF SECTION

SECTION 01200
PROJECT MEETINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements for Project meetings, including but not limited to, the following:

1. Job start meeting.
2. Pre-installation conferences.
3. Progress meetings.
4. Meetings as required by the OAR.

1.02 RELATED SECTIONS

A. Section 01100: Coordination
B. Section 01300: Submittals
C. Section 01365: Construction Schedule

PART 2 – PRODUCTS

PART 3 - EXECUTION

3.01 JOB START MEETING

A. In accordance with General Condition Article 2.6, OAR will schedule a job start meeting before starting the Work, at a time and date determined by OAR. Meeting shall be held at the Project site or another location as determined by OAR. Meeting will be held in order to review responsibilities, procedures, and other administrative requirements contained within the Contract Documents.

B. Authorized representatives of OWNER, IOR, ARCHITECT, CONTRACTOR and other parties shall attend the meeting. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda items shall include significant items which could affect progress of the Work, including, but not limited to the following:

1. Preliminary Construction Schedule
2. Critical work sequencing
3. Designation of responsible personnel

4. Identification of OAR
5. Procedures for processing field decisions
6. Request for Proposal
7. Construction Directive and Change Order
8. Procedures for processing Applications for Payment
9. Prevailing wages
10. Submittal of Shop Drawings, Product Data, material lists, and Samples
11. Preparation of project record documents
12. Use of the Project site and/or premises
13. Parking availability
14. Office, work, and storage areas
15. Equipment deliveries and priorities
16. Safety procedures
17. First Aid
18. Security
19. Housekeeping
20. Working hours
21. Insurance Services including OCIP
22. Environmental Health & Safety

D. OAR shall prepare and issue meeting minutes to attendees and interested parties no later than five (5) calendar days after the meeting date.

3.02 PRE-INSTALLATION CONFERENCES

A. CONTRACTOR shall coordinate and conduct pre-installation conferences at the Project site as required by related Sections of the Contract Documents.

B. CONTRACTOR, manufacturers, and fabricators involved in or affected by the installation and its coordination or integration with other pre-ceding and/or subsequent installations of Work shall attend the meeting. CONTRACTOR shall advise OAR, IOR, and ARCHITECT of scheduled meeting dates in order to secure their attendance.

1. CONTRACTOR shall review the progress of construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:

a. Contract Documents
b. Options
c. Related Construction Directives and Change Orders
d. Purchases
e. Deliveries
f. Shop Drawings, Product Data, and quality-control samples
g. Review of mockups

h. Possible conflicts
i. Compatibility problems
j. Time schedules
k. Weather limitations
l. Manufacturer's recommendations
m. Warranty requirements
n. Compatibility of materials
o. Acceptability of substrates
p. Temporary facilities
q. Space and access limitations
r. Governing regulations
s. Safety
t. Inspecting and testing requirements
u. Required performance results
v. Recording requirements
w. Protection

2. CONTRACTOR shall record significant discussions and directives received from each conference. CONTRACTOR shall, within three (3) calendar days after the meeting date, distribute the minutes of the meeting to all concerned parties, including but not limited to, OAR, IOR, and ARCHITECT.

3.03 PROGRESS MEETINGS

A. Progress meetings will be held at the Project site on a weekly basis.

B. In addition to representatives of CONTRACTOR, OWNER, and ARCHITECT, each Subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of the Work shall, if requested by OAR, be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude all matters relating to the Work.

C. Failure of the CONTRACTOR to be so represented at any progress meeting which is held at a mutually agreed time or for which a written notice is given, shall not relieve CONTRACTOR from abiding by any and all OAR or ARCHITECT determinations or directives issued at such meeting.

D. OAR will review and correct or approve minutes of the previous progress meeting and will review other significant items affecting progress. Topics for discussion as appropriate to the status of the Project include but are not limited to:

1. Interface requirements
2. Construction Schedule

3. Sequence and coordination
4. Status of submittals / RFC's
5. Deliveries
6. Off-site fabrication
7. Access
8. Site utilization
9. Temporary Construction Facilities and Controls
10. Hours of work
11. Hazards and risks
12. Housekeeping
13. Quality and workmanship
14. Unforeseen conditions
15. Testing and Inspection
16. Defective Work
17. Construction Directive
18. Request for Proposal
19. Change Order Proposals and Change Orders
20. Documentation of information for payment requests
21. Application for Payment
22. Other items as required or as brought forth.

E. No later than three (3) calendar days after each progress meeting, OAR will prepare and distribute minutes of the meeting to each present and absent party. Include a brief summary, in narrative form, of progress, decisions, directives, actions taken, and all other issues since the previous meeting and report.

1. Schedule Updating: If required, CONTRACTOR shall revise the Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the next scheduled progress meeting.

3.04 ADDITIONAL MEETINGS

A. OAR, upon giving notice to the intended parties and without further obligation, may require additional meetings to discuss Work and/or Project related activities.

END OF SECTION

SECTION 01300
SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Administrative and procedural requirements for submittals required for the Work, including but not limited to; Shop Drawings, Product Data, Samples, material lists, and quality control items as required by the Contract Documents.

B. Wherever possible, throughout the Contract Documents, the minimum acceptable quality of workmanship and products has been defined by the name and catalog number of a manufacturer and by reference of recognized industry standards.

C. To ensure that specified products are furnished and installed in accordance with the design intent, procedures have been established for submittal of design data and for its review by ARCHITECT, OAR and/or others.

1.02 RELATED SECTIONS

A. Section 01100: Coordination
B. Section 01120: Cutting and Patching
C. Section 01365: Construction Schedule
D. Section 01640: Substitutions
E. Section 01700: Contract Closeout
F. Section 01740: Warranties

PART 2 – PRODUCTS

PART 3 - EXECUTION

3.01 PROCEDURES

A. CONTRACTOR shall package each submittal appropriately for transmittal and handling. CONTRACTOR shall transmit each submittal to ARCHITECT with concurrent copy of the transmittal to the OAR. ARCHITECT and/or OAR will not accept submittals received from sources other than from CONTRACTOR.

B. After ARCHITECT review, ARCHITECT will transmit submittals to OAR and OAR shall further distribute to CONTRACTOR, IOR and/or others as required. Work shall not commence, unless otherwise approved by OAR, until approved submittals are transmitted to CONTRACTOR.

C. CONTRACTOR shall clearly identify any deviations from the Contract Documents on each submittal. Any deviation not so noted even though stamped reviewed is not acceptable.

D. CONTRACTOR shall coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities requiring sequential activity.

E. Timing of Submittals:

1. In accordance with General Conditions, CONTRACTOR shall submit to ARCHITECT, with copy of transmittal to the OAR, those Shop Drawings, Product Data, diagrams, materials lists, Samples and other submittals required by the Contract Documents.

2. The schedule of submittals shall provide adequate time between submittals in order to allow for proper review without negative impact to the Construction Schedule.

3. Schedule of submittals shall be related to Work progress, and shall be so organized as to allow sufficient time for transmitting, reviewing, corrections, resubmission, and re-reviewing.

4. CONTRACTOR shall coordinate submittal of related items and ARCHITECT reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received by ARCHITECT.

5. CONTRACTOR shall revise, update and submit submittal schedule to ARCHITECT and OAR on the first of each month, or as required by OAR.

6. CONTRACTOR shall allow in the Construction Schedule, at least sixteen (16) days for ARCHITECT review following ARCHITECT receipt of submittal. For plumbing, Landscape, and other submittals requiring joint review with OAR, CONTRACTOR shall allow a minimum of eighteen (18) days following ARCHITECT receipt of submittal.

7. No adjustments to the Contract Time and/or Milestones will be authorized because of a failure to transmit submittals to ARCHITECT sufficiently in advance of the Work to permit review and processing.

8. In case of product substitution, Shop Drawing preparation shall not commence until such time ARCHITECT and OAR reviews said submittal relative to the General Conditions.

G. If required, resubmit submittals in a timely manner. Resubmit as specified for initial submittal but identify as such. Review times for re-submitted items shall be as per the time frames for initial submittal review.

H. Shop Drawing preparation shall not commence until such time as CONTRACTOR receives Product Data approval.

I. ARCHITECT, or authorized agent, will stamp each submittal with a uniform, action stamp. ARCHITECT, or authorized agent, will mark the stamp appropriately to indicate the action taken, as follows:

1. Final Unrestricted Release: When ARCHITECT, or authorized agent, marks a submittal " Reviewed, " the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.

2. Final-But-Restricted Release: When ARCHITECT, or authorized agent, marks a submittal " Reviewed as Noted," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.

3. Returned for Re-submittal: When ARCHITECT, or authorized agent, marks a submittal " Rejected, Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat as necessary to obtain different action mark. In case of multiple submittals covering same items of Work, CONTRACTOR is responsible for any time delays, schedule disruptions, out of sequence Work, or additional costs due to multiple submissions of the same submittal item. Do not use, or allow others to use, submittals marked "Rejected, Revise and Resubmit" at the Project site or elsewhere where Work is in progress.

4. Other Action: Where a submittal is for information or record purposes or special processing or other activity, the ARCHITECT, or authorized agent, will return the submittal marked "Action Not Required ".

3.02 SHOP DRAWINGS

A. Shop Drawings are original drawings prepared by CONTRACTOR, Subcontractor, supplier, or distributor illustrating some portion of Work by showing fabrication, layout, setting, or erection details. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings.

B. Produce Shop Drawings to an accurate scale that is large enough to indicate all pertinent features and methods. Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 x 11 inches but no larger than 24 x 36 inches.

C. Shop Drawings shall include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:

1. Dimensions
2. Identification of products and materials included by sheet and detail number.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.

D. Provide a space of approximately 4 by 5 inches on the label or beside the title block on Shop Drawings to record CONTRACTOR and ARCHITECT review, and the action taken. Include the following information on the label for processing and recording action taken:

1. Project name.
2. Date.
3. Name and address of ARCHITECT.
4. Name and address of CONTRACTOR.
5. Name and address of Subcontractor.
6. Name and address of supplier.
7. Name and address of manufacturer.
8. Name and title of appropriate Specification section.
9. Drawing number and detail references, as appropriate.

E. Unless otherwise agreed to or indicated in individual Specification sections, submit a sufficient number to allow for adequate CONTRACTOR, Subcontractor, supplier, manufacturer and fabricators distribution plus two sets to be retained by ARCHITECT, one set to IOR and one set to OAR. .

3.03 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of Work or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, wiring diagrams, schedules, illustrations, or performance curves.

1. Mark each copy to show or delineate pertinent materials, products, models, applicable choices, or options. Where Product Data includes information on

several products that are not required, clearly mark copies to indicate the applicable information. Include the following information:

a. Manufacturer's printed recommendations.
b. Compliance with trade association standards.
c. Compliance with recognized testing agency standards.
d. Application of testing agency labels and seals.
e. Notation of dimensions verified by field measurement.
f. Notation of coordination requirements.
g. Notation of dimensions and required clearances.
h. Indicate performance characteristics and capacities.
i. Indicate wiring diagrams and controls.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed. .

C. Required Copies and Distribution: Same as denoted in sub - section 3.02, E.

3.04 SAMPLES

A. Procedure:

1. Submit Samples of sufficient size, quantity, cured and finished and physically identical to the proposed product or material. Samples include partial or full sections or range of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches denoting color, texture, and/or pattern.

a. Mount or display Samples in the manner to facilitate review of qualities indicated. Include the following:

1. Specification section number and reference.
2. Generic description of the Sample.
3. Sampling source.
4. Product name or name of manufacturer.
5. Compliance with recognized standards.
6. Availability and delivery time.

2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

a. Where variations in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show the approximate limits of the variations.

b. Refer to other Specification sections for requirements for Samples that illustrate workmanship, fabrication techniques, assembly details, connections, operation, and similar construction characteristics.

c. Refer to other sections for Samples to be returned to CONTRACTOR for incorporation into the Work. Such Samples must be undamaged at time of installation. On the transmittal indicate special requests regarding disposition of Sample submittals.

d. Samples not incorporated into the Work, or otherwise not designated as OWNER property, remain the property of CONTRACTOR and shall be removed from the Project site prior to Substantial Completion.

3. Color and Pattern: Whenever a choice of color or pattern is available in a specified product, submit accurate color chips and pattern charts to OAR for review and selection.

4. Number Required: Submit 5 of each. Two will be returned to CONTRACTOR with one to ARCHITECT, OAR, and IOR.

B. When specified, erect field Samples and mock-ups at the Project site to illustrate products, materials, or workmanship and to establish standards by which completed Work shall be judged.

C. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of the Work. Sample sets may be used to obtain final acceptance of the Work associated with each set.

3.05 QUALITY CONTROL SUBMITTALS

A. Submit quality control submittals, including design data, certifications, manufacturer's field reports, and other quality control submittals as required under other sections of the Contract Documents.

B. When other sections of the Contract Documents require manufacturer's certification of a product, material, and/or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.

C. Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the represented company.

D. Requirements for submittal of inspection and test reports are specified in other sections of the Contract Documents.

END OF SECTION

SECTION 01340
CONSTRUCTION & DEMOLITION WASTE MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Preparation and implementation, including reporting and documentation, of a Waste Management Plan for reusing, recycling, salvage or disposal of non-hazardous waste materials generated during demolition and/or new construction (Construction & Demolition (C&D) Waste), to foster material recovery and re-use and to minimize disposal in land fills.

B. Related Sections

1. Section 01300: Submittals

2. Section 01700: Contract Closeout

1.02 REFERENCES

A. California Integrated Waste Management Act of 1989 (AB 939)

B. California Code of Regulations Title 14, Section 18700 et seq.

1.03 SYSTEM DESCRIPTION

A. Collection and separation of all C&D waste materials generated on-site, reuse or recycling on-site, transportation to approved recyclers or reuse organizations, or transportation to legally designated landfills, for the purpose of recycling salvaging and/or reusing a minimum of 75% of the C&D waste generated.

1.04 SUBMITTALS

A. C&D Waste Management Plan (Exhibit 1): Within 10 calendar days after the Notice to Proceed and prior to any waste removal, submit the following to the OAR for review and approval. Update quarterly. Include:

1. Materials to be recycled, reused, or salvaged, either onsite or offsite.

2. Estimates of C&D waste quantity (in tons) by type of material. (If waste is measured by volume, give factors for conversion to weight in tons.)

3. Procedures for recycling/ reuse program.

4. Permit or license and location of Project waste-disposal areas.D

5. Site plan for placement of waste containers.

B. C&D Waste Management Monthly Progress Report (Exhibit 2): Summary of waste generated by Project, monthly with Application for Payment. Include:

1. Firms accepting the recovered or waste materials.

2. Type and location of accepting facilities (landfill, recovery facility, used materials yard, etc.). If materials are reused or recycled on the Project site, location should be designated as "on-site reuse / recycling".

3. Type of materials and net weight (tons) of each.

4. Value of the materials or disposal fee paid.

5. Attach weigh bills and other documentation confirming amount and disposal location of waste materials.

C. C&D Waste Management Final Compliance Report: Final update of Waste Management Plan to provide summary of total waste generated by Project.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.01 IMPLEMENTATION

A. Implement approved Waste Management Plan including collecting, segregating, storing, transporting and documenting each type of waste material generated, recycled or reused, or disposed in landfills.

B. Designate an on-site person to be responsible for instructing workers and overseeing the sorting and recording of waste/ recyclable materials.

C. Include waste management and recycling in worker orientation and as an agenda item for regular Project meetings.

D. Recyclable and waste bin areas shall be limited to areas approved on the Waste Management Plan. Keep recycling and waste bins neat and clearly marked to avoid contamination of materials.

3.02 ATTACHMENTS

A. Exhibit 1: Waste Management Plan

B. Exhibit 2: Waste Management Monthly Progress Report.

END OF SECTION

EXHIBIT 1
WASTE MANAGEMENT PLAN
CONSTRUCTION/ MAINTENANCE/ALTERATION & DEMOLITION PROJECTS

PROJECT NAME: **«PROJECTTITLE» «CONTRACTTITLE»**
PROJECT NO: **«Project Number»**
NAME OF COMPANY:
CONTACT PERSON:
TELEPHONE:
PROJECT SITE LOCATION:
PROJECT TYPE: ☐ NEW CONSTRUCTION ☐ DEMOLITION
☐ MAINTENANCE/ALTERATION PROJECTS
PROJECT SIZE (SQ. FT.):
DATE & ESTIMATED PERIOD

(1) Material Type	(2) Tons Estimated Recycle	(3) Tons Estimated Reuse	(4) Tons Estimated Salvage	(5) Tons Estimated Landfill	(6) Proposed Disposal or Recycling Facility (e.g., Onsite, Name of Facility)
Total					
Diversion Rate: Columns [(2)+(3)+(4)] / [(2)+(3)+(4)+(5)]					=

Signature	Title	Date

Column 1	"Material Types" – Enter type of materials targeted for recycling, reuse, and/or salvage, either on- or off-site, and include a category for waste materials requiring disposal.
Columns 2 thru 4	"Estimated Generation" - Enter estimated quantities (tons) of recyclable, reusable, or salvageable waste materials anticipated to be generated and state number of salvageable items.
Column 5	"Estimated Landfill" - Enter quantities (tons) of materials to be disposed in landfill.
Column 4	"Disposal Location" - Enter end-destination of recycled, salvaged, and disposed materials.
General :	(1) Attach proposed Recycling & Waste Bin Location Plan.
	(2) Attach name and contact data for each recycling or disposal destination to be used.

EXHIBIT 2
WASTE MANAGEMENT PROGRESS REPORT
CONSTRUCTION/ MAINTENANCE/ALTERATION & DEMOLITION PROJECTS

PROJECT NAME: **«PROJECTTITLE» «CONTRACTTITLE»**
PROJECT NO: **«Project Number»**
NAME OF COMPANY:
CONTACT PERSON:
TELEPHONE:
PROJECT SITE LOCATION:
PROJECT TYPE: ☐ NEW CONSTRUCTION ☐ DEMOLITION
☐ MAINTENANCE/ALTERATION PROJECTS
PROJECT SIZE (SQ. FT.):
PERIOD to

(1) Material Type	(2) Tons Actual Recycle	(3) Tons Actual Reuse	(4) Tons Actual Salvage	(5) Tons Actual Landfill	(6) Disposal or Recycling Facility (e.g., Onsite, Name of Facility)
Total					
Diversion Rate: Columns [(2)+(3)+(4)] / [(2)+(3)+(4)+(5)]					=

Signature	Title	Date

Column 1	"Material Types" – Enter type of materials targeted for recycling, reuse, and/or salvage, either on- or off-site, and include a category for waste materials requiring disposal.
Columns 2 thru 4	"Estimated Generation" - Enter estimated quantities (tons) of recyclable, reusable, or salvageable waste materials anticipated to be generated and state number of salvageable items.
Column 5	"Estimated Landfill" - Enter quantities (tons) of materials disposed.
Column 4	"Disposal Location" - Enter end-destination of recycled, salvaged, and disposed materials.
General :	(1) Attach proposed Recycling & Waste Bin Location Plan.
	(2) Attach name and contact data for each recycling or disposal destination to be used.

SECTION 01365

CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Construction Schedule procedures, preparation, submittal, updates, and revisions.

1.02 RELATED SECTIONS

A. Section 01005: Summary of the Work

B. Section 01300: Submittals.

C. Section 01700: Contract Closeout.

1.03 PROCEDURES

A. Within 7 calendar days after date of Notice to Proceed, CONTRACTOR shall submit to OWNER for review, a detailed Construction Schedule setting forth all requirements for complete execution of the Work.

B. Seven (7) calendar days after receipt of the OWNER'S review comments, submit a final Construction Schedule acceptable to OWNER.

C. If a Construction Schedule is considered by OWNER to not be in compliance with any requirement of the Contract, CONTRACTOR will be notified to review and revise the Construction Schedule and bring it into compliance. Failure of CONTRACTOR to submit a Construction Schedule in full compliance with the Contract Documents will result in a delay in progress payment processing. The Construction Schedule is to be used in evaluating progress for payment approval.

D. Subsequently with each Progress Payment Request, CONTRACTOR shall deliver to OWNER an updated Construction Schedule reflecting Work progress to the end of the Progress Payment Request period. Each such Construction Schedule shall indicate actual progress to date in execution of the Work, together with a projected schedule for completion of all the Work.

E. All schedule submittals are subject to review and acceptance by OWNER. OWNER retains the right to withhold progress payments until CONTRACTOR submits a Construction Schedule acceptable to OWNER.

F. Concurrent with OWNER'S acceptance of CONTRACTOR’S submitted Construction Schedule, shall be CONTRACTOR'S signature of acceptance.

1.04 SCHEDULE SUBMITTAL PREPARATION GUIDELINES

A. The Contract Work shall be scheduled and progress monitored using a Critical Path Method (CPM) network type scheduling system. Schedule shall be broken into sub-activities which shall, as a minimum, include major suppliers, all submittal approvals, all major trades, plumbing, mechanical, electrical, security, fire, and elevators/escalators. Scheduling system shall indicate all inter-relationships between trades and suppliers.

B. Construction Schedule shall represent a practical plan to complete the Work within the Contract time requirement.

1. A schedule extending beyond Contract time or less than Contract time will not be acceptable.

2. A schedule found unacceptable by OWNER shall be revised by CONTRACTOR and resubmitted.

C. Construction schedule shall clearly indicate sequence of construction activities, grouped by applicable phase and sorted by areas, buildings, or facilities within phase, and shall specifically indicate:

1. Start and completion of all Work items, their major components, and interim milestone completion dates, as determined by CONTRACTOR and OWNER.

2. Activities for procurement, delivery, installation of equipment, materials, and other supplies, including:

a. Time for submittals, resubmittals, and reviews. Include decision dates for selection of finishes.

b. Time for manufactured products for the Work fabrication and delivery.

c. Interdependence of procurement and construction activities.

d. As applicable, dates for testing, balancing equipment, and final inspection.

D. Schedule shall be in sufficient detail to assure adequate planning and execution of the Work.

1. Each task activity shall range in duration from a 1 workday minimum to a 15 workday maximum and shall be total of actual days required for completion. The activity duration shall not include consideration of weather impact on completion of that activity.

2. Schedule shall be suitable, in judgment of OWNER, to allow monitoring and evaluation of progress in performance of the Work; it shall be calendar time-scaled.

3. Activities shall include:

a. Description; what is to be accomplished and where.

b. Workday duration.

c. Scheduled activities shall indicate continuous flow, from left to right.

4. CONTRACTOR shall setup up the schedule calendar to identify workdays per week and shifts per day worked, non-work days, weekends and holidays.

E. Failure to include any element of Work required for performance of this Contract shall not excuse CONTRACTOR from completing Work required to comply with the Contract Documents, notwithstanding acceptance of Construction Schedule.

F. Submittal of Construction Schedule shall be understood to be CONTRACTOR'S confirmation that the schedule meets requirements of the Contract Documents, and that the Work will be executed in sequence indicated in schedule.

1.05 REVIEWS, UPDATES, AND REVISIONS

A. OWNER will review and return the initial submittal of CONTRACTOR'S Construction Schedule, with summary comments, within 7 calendar days. If revisions are required, CONTRACTOR shall resubmit Schedule within 7 calendar days following receipt of OWNER'S comments.

B. CONTRACTOR shall analyze and update the Project Construction Schedule:

1. As part of monthly payment application, CONTRACTOR shall submit to and participate with OWNER in a schedule review to include:

a. Actual start dates for Work items started during report period.

b. The percent (%) complete on activities that have actual start dates.

c. Actual completion dates for Work items completed during report period.

d. Estimated remaining duration for Work items in progress, which will not exceed original duration for activity.

e. Estimated start dates for Work items scheduled to start during month following report period, if applicable.

f. Changes in duration of Work items.

2. In case of a change to CONTRACTOR'S planned sequence of Work, CONTRACTOR shall include a narrative report with updated progress schedule which shall include, but not be limited to, a description of problem areas, current and anticipated delaying factors, and any proposed revisions for a recovery plan.

3. All Change Orders affecting the schedule shall be clearly identified as separate and new activities integrated into the schedule at the appropriate time and in the appropriate sequence as reviewed and approved by OWNER.

4. The Project Construction Schedule Review will not relieve CONTRACTOR of responsibility for accomplishing all Work in accordance with the Contract Documents.

D. Updates: CONTRACTOR shall submit to OWNER, with each payment application, an up-to-date Project Construction Schedule to include following:

1. Work Item Report: Detailing Work items and dependencies as indicated on the Schedule.

2. Separate listing of activities completed during reporting period.

3. Separate listing of activities which are currently in progress, indicating their remaining duration and percentages completed.

4. Separate listing of activities which are causing delay in Work progress.

E. Scheduling of change or extra Work orders is responsibility of CONTRACTOR.

1. CONTRACTOR shall revise the Project Construction Schedule to incorporate all activities involved in completing change orders or extra Work orders and submit it to OWNER for review.

F. If OWNER finds CONTRACTOR is entitled to extension of any completion date, under provisions of the Contract, OWNER'S determination of total number of days of extension will be based upon an analysis of the current Project Construction Schedule, and upon data relevant to the extension.

G. CONTRACTOR acknowledges and agrees that delays to non-critical activities will not be considered a basis for a time extension unless activities become

critical. Non-critical activities are those activities which, when delayed, do not affect an interim or Substantial Completion date.

H. Any claim for extension of time shall be made in writing to OWNER not more than 7 days after commencement of delay; otherwise, it shall be deemed waived for all purposes. CONTRACTOR shall provide an estimate of the probable effect of such a delay on progress of Work as part of claim.

1.06 CONTRACTOR'S RESPONSIBILITY

A. Nothing in these requirements shall be deemed to be an usurpation of CONTRACTOR'S authority and responsibility to plan and schedule Work as CONTRACTOR sees fit, subject to all other requirements of Contract Documents.

B. CONTRACTOR shall provide at all times sufficient competent labor, materials, and equipment to properly carry on Work and to insure completion of each part in accordance with Construction Schedule and within time agreed.

C. CONTRACTOR shall be responsible for ensuring that all submittals to the OWNER are accurate and consistent. Damage, including extra time and cost, caused by inaccuracies from CONTRACTOR will be compensated by CONTRACTOR.

1.07 SUSPENSION OF PAYMENTS

A. Initial Submittal: If CONTRACTOR fails to comply with the specified requirements, OWNER reserves the right to engage an independent scheduling consultant to fulfill these requirements. Upon additional notice to CONTRACTOR, OWNER shall retain against CONTRACTOR all incurred costs for additional services.

B. Update Submittals: OWNER has the right to withhold progress payments if CONTRACTOR fails to update and submit the Project Construction Schedule and reports as required by OWNER.

1.08 RECORD COPY

A. Prior to the Contract Completion, CONTRACTOR shall submit the Project Construction Schedule showing the as-built sequence. The as-built schedule shall have all activities with actual start and end dates.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01420
TESTING AND INSPECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Testing and inspection services to meet requirements of the California Building Code (CBC), Title 24, Parts 1 and 2, as indicated on the Drawings.

B. One or more DSA certified inspectors employed by the OWNER in accordance with the requirements of California Building Standards Administrative Code will be assigned to the Work with their duties as specifically defined in Section 4-333(b).

C. Tests of materials are required by a DSA certified testing agency as set forth in Section 4-335 of the California Building Standards Administrative Code.

1.02 RELATED SECTIONS

A. Section 01120: Cutting and Patching
B. Section 01300: Submittals
C. Section 01365: Construction Schedule
D. Section 01600: Materials and Equipment
E. Section 01700: Contract Closeout
F. Section 01740: Warranties

PART 2 – PRODUCTS (Not applicable)

PART 3 – EXECUTION

3.01 TESTS

A. OWNER will select an independent testing agency to conduct tests, sampling, and testing of materials. Selection of material to be tested shall be by the agency and not by CONTRACTOR.

B. Any material shipped from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from IOR such testing and inspection is not required shall not be incorporated into the Work.

C. OWNER will select and directly reimburse testing agency the costs for all DSA and/or DSA required tests and inspections, but may be reimbursed by

CONTRACTOR for such costs as noted in related sections of the Contract Documents.

D. The independent testing agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work. The agency shall not perform any duties of CONTRACTOR.

3.02 TEST REPORTS

A. Test reports shall include all tests performed, regardless of whether such tests indicate the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations as required shall also be reported. Reports shall indicate the material or materials were sampled and tested in accordance with requirements of CBC, Title 24, Parts 1 and 2, as indicated on the Drawings. Test reports shall indicate specified design strength. They shall also definitely state whether or not material or materials tested comply with the specified requirements.

3.03 VERIFICATION OF TEST REPORTS

A. Each testing agency shall submit to the Division of the State Architect a verified report in duplicate covering tests which are required to be performed by that agency during progress of the Work. Such report shall be furnished each time construction on the Work is suspended, covering tests up to that time, and prior to Final Completion of the Work, covering all tests.

3.04 INSPECTION BY OWNER

A. OWNER and its representatives shall at all times have access, for purpose of inspection, to all parts of the Work and to shops wherein the Work is in preparation, and CONTRACTOR shall at all times maintain proper facilities and provide safe access for such inspection.

B. OAR shall have the right to reject materials and/or workmanship deemed defective Work, and to require correction. Defective workmanship shall be corrected in a satisfactory manner and defective materials shall be removed from the premises and legally disposed of, all without charge to OWNER. If CONTRACTOR does not correct such defective Work within a reasonable time, fixed by written notice and in accordance with the terms and conditions of the Contract Documents, OWNER may correct such defective Work and proceed in accordance with related Articles of the Contract Documents.

C. CONTRACTOR is responsible for compliance to all applicable local, state, and federal regulations regarding codes, regulations, ordinances, restrictions, and requirements.

3.05 INSPECTOR OF RECORD

A. Inspector of Record is employed by OWNER in accordance with requirements of Title 24 of the California Code of Regulations with their duties specifically defined therein.

B. Inspection of Work shall not relieve CONTRACTOR from any obligation to fulfill all of the terms and conditions of the Contract Documents.

C. CONTRACTOR shall be responsible for scheduling times of inspection, tests, sample taking, and similar activities of the Work.

3.06 TESTS AND INSPECTIONS

The following tests and inspections do not limit inspection of the Work but are required by DSA, other agencies, or are required in related Sections of the Contract Documents.

See DSA Testing and Inspection form DSA 103 for all required testing for this project.

END OF SECTION

SECTION 01600
MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section includes administrative and procedural requirements governing selection of products for incorporation into the Work.

1.2 RELATED SECTIONS

A. Section 01100: Coordination
B. Section 01300: Submittals
C. Section 01640: Substitutions
D. Section 01740: Warranties

1.3 DEFINITIONS

A. Definitions used in this Section are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and other similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation into the Work, whether purchased for the Work or taken from previously purchased stock. The term "product" includes the terms "material" and "equipment" and terms of similar intent.

a. "Named Products," are items identified by the manufacturer's product name, including make, model number or other designation, shown or listed in the manufacturer's published product literature, current as of the date of the Contract.

b. "Foreign Products," as distinguished from "domestic products," are items substantially manufactured (50 percent or more of value) outside the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of, nor living within, the United States and its possessions are also considered to be foreign products.

2. "Materials," are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

3. "Equipment," is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 SUBMITTALS

A. Material list: Prepare a list in tabular form acceptable to ARCHITECT and/or OAR showing proposed products. Include generic names. Include the manufacturer's name and proprietary names for each item listed.

1. Coordinate material list with the Construction Schedule and the submittal schedule.

2. Form: Prepare material list with information on each item tabulated under the following column headings.

   a. Related Specification Section number
   b. Generic name used in 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

3. Initial Submittal: Within ten (10) days after execution of each subcontract agreement, as set forth in General Condition Article 6.25, submit three (3) copies of an initial material list to the ARCHITECT with a copy to the OAR. Provide a written explanation for omissions of data and for known variations from the Contract Documents.

4. ARCHITECT Action: ARCHITECT will respond in writing to OAR within fourteen (14) days and OAR will forward response to CONTRACTOR within sixteen (16) days of receipt of the completed material list. No response outside this period constitutes no objection to listed items but does not constitute a waiver of the requirement that selected items comply with the Contract Documents. ARCHITECT response will include a list of unacceptable item selections, containing a brief explanation of reasons for this action.

1.5 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

1. CONTRACTOR is to verify necessary lead times for all materials; however, when specified products are available only from sources that do not, or cannot, produce a quality adequate to complete Work in a timely manner, consult with the ARCHITECT to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing these qualities, to the fullest extent possible.

B. Compatibility of Options: When the CONTRACTOR is given the option of selecting between two or more products for use in the Work, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion into the Work:

1. No available domestic product complies with the Contract Documents.

2. Domestic products that comply with the Contract Documents are available only at prices or terms substantially higher than foreign products that comply with the Contract Documents.

D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer’s or producer's nameplates or trademarks on exposed surfaces of products that will be exposed in view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

a. Name of product and manufacturer
b. Model and serial number
c. Capacity

d. Speed
e. Ratings

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the Project site and to prevent overcrowding of Work spaces.

2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to the Project site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

5. Store products at the Project site in a manner that will facilitate inspection and measurement of quantity or counting of units.

6. Store heavy materials away from structures in a manner that will not endanger the structure's supporting construction.

7. Store products subject to damage by the elements above ground, under cover in a weather-tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MATERIAL SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.

2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other Projects.

B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where Specifications name only a single material or manufacturer, provide the product indicated. No substitutions will be permitted.

2. Semi-proprietary Specification Requirements: Where Specifications name two or more products or manufacturers, provide one of the products indicated. No substitutions will be permitted.

    a. Where Specifications specify products or manufacturers by name, accompanied by the term "or equal" comply with General Condition Article 6.14 to obtain approval for use of an unnamed product.

3. Descriptive Specification Requirements: Where Specifications describe a product or assembly, list exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with the Contract Documents.

4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.

    a. Manufacturer's recommendations may be contained in published material literature or by the manufacturer's certification of performance.

5. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes, or regulations specified.

6. Visual Matching: Where Specifications require matching an established Sample, decision of the ARCHITECT will be final on whether a proposed product matches satisfactorily.

7. Visual Selection: Where specified product requirements include the phrase "… as selected from manufacturer's standard or premium colors, patterns, textures…" or a similar phrase, select a product and manufacturer that complies with other specified requirements. The ARCHITECT will select the color, pattern, and texture from the product line selected.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located, and aligned with other Work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration until Substantial Completion.

END OF SECTION

SECTION 01640
SUBSTITUTIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for handling requests for substitutions submitted eleven (11) days or more after the date established in the Notice to Proceed.

1.2 RELATED SECTIONS

A. Section 01300: Submittals
B. Section 01600: Materials and Equipment

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 APPLICATION

A. CONTRACTOR proposed changes in products or materials required by the Contract Documents eleven (11) days or more after the date established in the Notice to Proceed, are considered to be requests for substitutions. OAR will consider requests for substitution if a product is no longer manufactured and/or cannot be acquired from existing inventories. The following are not considered to be valid requests for substitutions:

1. Revisions to the Contract Documents requested by OAR or ARCHITECT.

2. Specified options of products included in the Contract Documents.

3. Substitutions requested on a “or equal” basis.

3.2 SUBMITTALS

A. Transmit submittals as described in related Sections for each request for substitution.

1. Identify the product to be replaced in each request. Include related Specification Section and Drawing number.

2. Provide complete documentation denoting compliance with the requirements for substitutions, and the following information, as appropriate.

   a. A detailed comparison of significant qualities of the proposed substitution with those specified in the Contract Documents. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.

   b. Product Data, including Drawings, descriptions of products, fabrication, and installation procedures.

   c. Samples, where applicable or requested.

   d. CONTRACTOR certification the proposed substitution conforms to requirements of the Contract Documents in every respect and is appropriate for the applications indicated.

   e. CONTRACTOR waiver of rights to an increase in the Contract Amount, Milestones and/or Contract Time that may subsequently become necessary because of the failure of the substitution to adequately perform.

3. If required, ARCHITECT will request additional information or documentation for evaluation. OAR will notify CONTRACTOR of acceptance or rejection of the substitution.

4. ARCHITECT will review and consider request for substitution and provide a recommendation to OAR

5. Where a proposed substitution involves and/or effects more than one Subcontractor, CONTRACTOR shall ensure each Subcontractor cooperates with the other Subcontractor involved to coordinate the Work, provide uniformity and consistency, and assure compatibility of all products.

6. CONTRACTOR submittal and ARCHITECT review of Shop Drawings, Product Data, material lists or Samples do not constitute an acceptable or valid request for substitution.

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for Contract Closeout, including but not limited to, the following:

1. Inspection procedures.
2. Project record documents submittal.
3. Operation and maintenance manual submittal.
4. OWNER orientation and instruction.
5. Final cleaning.

B. Closeout requirements for specific Work activities are included in the appropriate Sections in Divisions 01 through 16.

1.02 RELATED SECTIONS

A. Section 01080: Application for Payment
B. Section 01300: Submittals
C. Section 01365: Construction Schedule
D. Section 01740: Warranties

PART 2 – PRODUCTS

PART 3 - EXECUTION

3.01 SUBSTANTIAL COMPLETION

A. Inspection Procedures: On receipt of a request for a certificate of Substantial Completion, OAR will either authorize commencement of inspection or advise CONTRACTOR of unfilled requirements. IOR, OAR, CONTRACTOR and ARCHITECT will inspect the Work and IOR shall prepare a comprehensive punch list of items to be completed.

1. IOR will repeat inspection when requested and assure the Work is complete.

2. Results of the completed inspection will form a partial basis of the requirements for Final Completion.

B. Re-inspection Procedures: IOR, OAR, CONTRACTOR and ARCHITECT will inspect the Work upon notice the Work, including final inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to OAR.

1. Upon completion of inspection, OAR will recommend Final Completion. If the Work is incomplete, OAR will advise CONTRACTOR of Work that is incomplete or of obligations that have not been fulfilled but are required for Final Completion.

2. If necessary, re-inspection will be repeated, but may be assessed against CONTRACTOR if OWNER is subject to additional professional service and or additional costs of inspection.

3.02 PROJECT RECORD DOCUMENT SUBMITTAL

A. General: Do not use project record documents for construction purposes. Protect record documents from deterioration and loss. Provide access to record documents for ARCHITECT, IOR and OAR reference during normal working hours. Project record document shall be updated on a weekly basis. Prior to submitting each application for payment, secure IOR and ARCHITECT approval of project record documents.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white prints of Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which Drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Drawings. Provide detailed and accurate field dimensions for concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Date and number entries in the same format as submitted. Call attention to entry by a “cloud” around the affected areas.

2. Mark new information important to OWNER but was not shown on Drawings or Shop Drawings.

3. Utility location and depth below finished grade and/or above ceilings and attic spaces shall be fully dimensioned and indicated on record drawings. Dimensions shall be measured from building lines or permanent landmarks and shall be triangulated to those features.

4. Note related Change Order or Construction Directive numbers where applicable. RFC submissions shall be referenced on each affected sheet, Drawing and/or Shop Drawing.

5. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.

6. Prior to Final Completion of the Work, and review of the project record drawings by ARCHITECT, prepare a final set of project record drawings incorporating all mark ups and information noted. Provide a hardline drawing set of record drawings printed on reproducible white bond paper. Submit final set of Record Drawings to ARCHITECT.

C. Record Specifications: Maintain two complete copies of the Specifications, including Addenda. Include with the Specifications two copies of other written Contract Documents, such as Change Orders and/or Construction Directives issued during construction.

1. Mark these record documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.

2. Give particular attention to substitutions and selection of options and information on concealed Work that cannot otherwise be readily discerned later by direct observation.

3. Note related record document information with Product Data.

4. Prior to Final Completion of the Work, submit record Specifications to ARCHITECT for OWNER records.

D. Record Product Data: Maintain two copies of each Product Data submittal. Note related Change Orders and Construction Directives and mark-up of record drawings and Specifications.

1. Mark these documents to illustrate significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Project site and from the manufacturer's installation instructions and recommendations.

2. Provide detailed and accurate information regarding concealed products and portions of Work that cannot otherwise be readily discerned later by direct observation.

3. Prior to Final Completion of the Work, submit complete set of record Product Data to the ARCHITECT for OWNER records.

E. Record Samples: Immediately prior to Substantial Completion, CONTRACTOR shall meet with ARCHITECT and OAR at the Project site to determine which Samples are to be transmitted to OWNER for record purposes. Comply with OAR instructions regarding delivery to OWNER storage area.

F. Miscellaneous Records: Refer to other Specification sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date of Final Completion, complete and compile miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to ARCHITECT for OWNER records.

G. Maintenance Manuals: Prior to Substantial Completion, organize operation and maintenance data into suitable two sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-3", 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Submit to OAR for ARCHITECT and for OWNER records. Include the following types of information.

1. Emergency instructions
2. Spare parts list
3. Copies of warranties
4. Wiring diagrams
5. Recommended "turn-around" cycles
6. Inspection procedures
7. Shop Drawings and Product Data
8. Fixture lamping schedule

H. Verified Reports: Construction progress of the Work shall be reported to DSA via a duly verified report as per Sections 4-336 and 4-343 of the California Building Standards Administrative Code.

3.03 CLOSEOUT PROCEDURES:

A. Operation and Maintenance Instructions: Prior to Substantial Completion, arrange for each installer of equipment that requires regular operation and maintenance to meet with designated OWNER personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Maintenance manuals

2. Record documents
3. Spare parts and materials
4. Tools
5. Lubricants
6. Fuels
7. Identification systems
8. Hazards
9. Cleaning
10. Warranties and bonds
11. Maintenance agreements and similar continuing commitments

3.04 FINAL CLEANING

A. General: Related sections of the Contract Documents specify general cleaning during performance of the Work. General cleaning is included in Division 01 Section "Construction Facilities and Temporary Controls".

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for a certificate of Substantial Completion.

    a. Clean exposed exterior hard-surfaced finished to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean.

    b. Clean the Project site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

END OF SECTION

SECTION 01740
WARRANTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers and/or installer's standard warranties on products and special product warranties.

1. Refer to the General Conditions for terms of the guarantee period for the Work.

1.2 RELATED SECTIONS

A. Section 01600: Materials and Equipment
B. Section 01700: Contract Closeout
C. All Necessary work related sections division 2-16

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 WARRANTY REQUIREMENTS

A. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties shall not relieve CONTACTOR of the warranty of the Work incorporating such materials, products, and/or equipment. Manufacturer's disclaimers and limitations on warranties do not relieve suppliers, manufacturers, installers, and Subcontractors of the requirement to countersign special warranties with CONTRACTOR.

B. Standard warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to OWNER.

C. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for OWNER.

D. Related Damages and Losses: When correcting failed or defective warranted Work, remove and replace Work that has been damaged as a result of such failure

or which must be removed and replaced to provide access for correction of warranted Work.

E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement with the reinstated warranty equal to the original warranty.

F. Replacement Cost: Upon determination the Work covered by a warranty has failed and/or is defective, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. CONTRACTOR is responsible for the cost of replacing or rebuilding defective Work regardless of whether OWNER has benefited from use of the Work through a portion of its anticipated useful service life.

G. OWNER Recourse: Expressed warranties made to OWNER are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which OWNER can enforce such other duties, obligations, rights, or remedies.

H. Rejection of Warranties: OAR reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

I. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, OAR reserves the right to refuse to accept the Work until CONTRACTOR presents evidence the entities required to countersign such commitments have done so.

3.2 SUBMITTALS

A. Submit written warranties to ARCHITECT prior to Final Completion of the Work. If the certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, submit written warranties as set forth in the certificate of Substantial Completion.

1. When a designated portion of the Work is partially used and/or occupied by OWNER, submit properly executed warranties to ARCHITECT within fifteen (15) days of the Partial Use or Occupancy of the designated portion of the Work.

B. When the Contract Documents require CONTRACTOR, or CONTRACTOR and a Subcontractor, installer, supplier or manufacturer to execute a special warranty, prepare a written document containing appropriate terms and identification, ready

for execution by the required parties. Submit a draft to OAR, through the ARCHITECT, for approval prior to final execution.

1. Refer to Divisions 02 through 16 for specific content requirements and particular requirements for submitting special warranties.

C. Form of Submittal: Prior to Final Completion of the Work, compile two copies of each required warranty properly executed by CONTRACTOR, or by CONTRACTOR and Subcontractor, installer, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the Specifications.

D. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8½ by 11" (115 by 280 mm) paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the item 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 the installer.

2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title and/or name, and name of CONTRACTOR.

3. When warranted Work requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

END OF SECTION

SECTION 024113

SITE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following

1. Demolition and removal of site improvements and all other related contiguous improvements as required. Refer to Contract Drawings for items and location.

2. Demolition, dismantling, cutting and alterations as indicated, specified, and required for completion of the Contract; for new construction, modernization and rehabilitation projects, as applicable. Includes items such as the following:
    1. Protecting existing work to remain.
    2. Salvageable items to be retained.
    3. Cleaning soiled materials that are to remain.
    4. Disconnecting and capping utilities.
    5. Removing debris and equipment.
    6. Removal of items indicated on drawings.

B. Demolition of Existing Building Foundations
1. Demolition and removal of all existing building foundations, footings, slabs, retaining walls, etc. shall be carried in a careful and orderly manner, and according to all applicable codes and regulations for demolition of structures, safety of adjacent structures, dust control and disposal of materials.
2. Sprinkle Work with water to minimize dust. Provide hoses and water connections for that purpose.

D. Demolition and Removal of Pavements
1. Markup all existing utilities on site.
2. Sawcut all Concrete Pavements, as indicated on Drawings.
3. Remove all indicated pavements, walkways, curb and gutter, concrete ditches, landscape areas, etc.

4. Protect all manhole and valve covers, lids, vaults and other site fixtures, marked to remain.

E. Related Sections: The following Sections contain requirements that relate to this Section:

1. Sections for “Photographic Documentation”, “Special Environmental Procedures”, ”Temporary Facilities”, “Tree and Plant Protection”, “Cutting and Patching” as applicable.
2. Division 31 for "Site Clearing" and “Earthwork” as applicable.
3. Asbestos-Containing Materials (ACMs) and/or other Hazardous Materials Report.

1.03 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the owners’ property.

B. Asbestos-Containing Materials (ACMs) and other hazardous materials: As identified in the Report, remove asbestos-containing materials (ASMs) and other identified hazardous materials.

C. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner’s property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner’s designated storage area.

D. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated or as directed by Owner.

E. Existing to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Architect and Owner, items may be removed to a suitable, protected storage location during demolition and then cleaned and reinstalled in their original locations.

1.04 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

B. Historical items indicated remain the Owner’s property. Carefully remove and salvage each item in a manner to prevent damage and deliver promptly to the Owner.

C. Historical items, archeological or paleontological findings, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques

and tablets, commemorative benches, antiques, and other items of interest or value to the Owner, which may be encountered during demolition, remain the Owner's property. If such items are encountered, all project operations shall cease in the area of discovery immediately. The Owner shall secure the services of an archeological consultant to assess the resources and determine a course of action.

1. Cooperate with Owner's archaeological consultant or historical adviser. Mitigated Negative Declaration (MND) for related requirements.

D. Human Remains: In the event that human remains are discovered, there shall be no disposition of such human remains, other than in accordance with the procedures and requirements set forth in the California Health and Safety Code and Public Resources Code. All project operations shall cease in the area of discovery immediately. In conjunction with the Owner, the Code provisions require immediate notification of the County Coroner and the Native American Heritage Commission.

1. Cooperate with the County Coroner, the Native American Heritage Commission representative and other related officials. Refer to the Mitigated Negative Declaration (MND) for related requirements.

1.05 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections, for information only, unless otherwise indicated.

B. Proposed dust-control measures.

C. Proposed noise-control measures.

D. Proposed signage.

E. Schedule of demolition activities indicating the following:

1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.

2. Dates for shutoff, capping, and continuation of utility services.

F. Inventory of items to be removed and salvaged.

G. Inventory of items to be removed by Owner, if any.

H. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by demolition operations.

I. Record drawings at Project closeout according to Section "Project Record Documents".

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

J. Landfill records for record purposes indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.06 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed demolition Work similar to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA & SCAQMD notification regulations before starting demolition. Observe applicable Best Practices and implementation of the Storm Water Pollution Prevention Plan (SWPPP). Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Pre-demolition Conference: Conduct conference at Project site to comply with pre-installation conference requirements of Division 01 Section "Project Meetings."

1.07 PROJECT CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical. Bidders shall make themselves fully aware of the existing conditions within the site. Scope limits scheduled for demolition and items/areas to remain protected in supplement to the Bid Drawings and Documents.

B. If conditions are encountered that vary from those indicated on plan, notify the Architect for instructions prior to proceeding.

C. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
   1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
   2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from owner.

D. Contractor to obtain all necessary encroachment and excavation permits from the local jurisdiction of authority for demolition of existing improvements in public right-of-way.

1.08 SCHEDULING

A. Arrange demolition schedule so as not to violate city construction ordinances.
B. Arrange demolition schedule with Owner.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Requirements for satisfactory soil materials are specified in Division 31 Section "Earthwork". Refer to the Geotechnical Investigation Report, dated August 2, 2023 prepared by Associated Soils Engineering, Inc., for site soil requirements.

1. Obtain approved borrow soil materials off-site when sufficient satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped. Test lines as required.

B. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. Survey existing conditions of the improvements such as light standards and trees to determine the best method(s) for removal so as not to cause potential damage to persons and property during the course of removal.

E. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

3.02 UTILITY SERVICES

A. Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.

1. Do not interrupt existing utilities serving occupied or operating facilities on or off the property, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.

a. Provide not less than 72 hours' notice to Owner if shutdown of service is required during changeover.

B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving structures to be demolished.

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

C. Utility Requirements: Refer to Division 33 Sections and Contract Drawings, for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.03 PREPARATION

A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.

B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

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

C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.

D. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.

E. Protect existing site improvements, appurtenances, and landscaping to remain.

1. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

3.04 CUTTING EXISTING CONCRETE

A. Cutting of existing concrete shall be done by experienced workers familiar with the requirements and space necessary for placing concrete. Perform concrete cutting with concrete cutting wheels and hand chisels. Take care not to damage concrete that is intended to remain.

B. Extent of cutting of concrete shall be as indicated on drawings and in accordance with standard plans for public works construction plan no. 132-3. Replace concrete that is removed in excess of amount indicated or required.

C. Prior to cutting or coring concrete, determine locations of hidden utilities and take necessary measures to protect them from damage.

D. If an existing pavement joint or cracked area is within two feet outside of a designated sawcut line shown on the Drawings, removal and resurfacing shall be to that joint, and/or shall include the crack or cracked area, unless otherwise approved by Architect.

3.05 EXPLOSIVES

A. Explosives: Use of explosives will not be permitted.

3.06 POLLUTION CONTROLS

A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

1. Do not create hazardous or objectionable conditions, such as ice, flooding, and pollution, when using water.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

C. Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

3.07 DEMOLITION

A. Demolition: Demolish improvements completely and remove from the site. Use methods required to complete Work within limitations of governing regulations and as follows:

B. Below-Grade Construction: Demolish foundation walls and other below-grade construction, as follows:

1. Completely remove below-grade construction, including foundation walls and footings unless noted otherwise on the drawings.

2. Break up and remove below-grade concrete slabs, unless indicated to remain.

C. Filling Below-Grade Areas: Completely fill below-grade areas and voids resulting from demolition of buildings and pavements with soil materials according to requirements specified in Division 31 Section "Earthwork."

D. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.

3.08 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

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

END OF SECTION

SECTION 025639
TEMPORARY TREE & PLANT PROTECTION

1.GENERAL

1. SUMMARY

A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work for Temporary Tree & Plant Protection, as shown in the Contract Drawings, and as specified herein this Section.

B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
   1. Protecting and maintaining existing trees and vegetation not specifically designated for removal, to remain.
   2. Protection shall be extended to trees and/or vegetation located within or directly adjacent to the Project Site, whether the tree trunk and/or vegetation are located within the designated Limits of Work.

C. Related Sections: The following Sections contain requirements that relate to Work in this Section:
   1. Section 328400 – Irrigation Systems.
   2. Section 329200 – Lawns and Grasses. <<<VERIFY>>>
   3. Section 329300 – Exterior Plants.
   4. Section 329360 – Palm Tree Planting. <<<VERIFY>>>
   5. Section 329400 – Landscape Planting Accessories.

2. DEFINITIONS AND APPLICABLE STANDARDS

A. References:
   1. ANSI – American National Standards Institute.
   2. ASTM – American Society for Testing & Materials.
   3. ISA – International Society of Arboriculture.
   4. USDA – United States Department of Agriculture.

B. Definitions:
   1. Tree – A woody perennial plant which usually has (but not limited to) a single dominant trunk and has a mature height of fifteen-feet (15') or more and has a trunk diameter (caliper) of three-inches (3") or more when measured at twenty-four-inches (24") above the finished grade. Tree shall also refer to palm species, where palms are measured in height to the apical meristem, per Section 329360 – Palm Tree Planting. <<<VERIFY>>>
   2. Drip-line – The outermost extent of the tree's foliaged canopy, which encompasses the tree leaves or fronds, trunk, branches, roots, and soil. In no case shall a drip line encompass an area under a tree canopy, which is less than ten-feet (10') in diameter. Since each tree is unique in size, scale, and form, the delineated drip-line of each tree shall be refined at the discretion of the Landscape Architect.

3. Injury – Bruising, scarring, tearing, gouging, or breaking of roots, branches, or trunk(s), soil compaction around the drip-line, or contamination around the drip-line which results in the decline to the health of the tree.
4. Root Zone– The soil volume surrounding a plant containing the roots.

C. Reference Standards:
1. *American National Standard for Tree Care Operation, Tree, Shrub, and Other Woody Plant Maintenance (ANSI A300),* American National Standards Institute, Latest Edition.
2. *American National Standard for Tree Care Operations (ANSI Z133),* American National Standards Institute, Latest Edition.
3. *Tree Pruning Guidelines*, International Society of Arboriculture, 1995 Edition.
4. *Pruning Standards for Shade Trees*, National Arborists Association, Latest Edition.

3. SUBMITTALS

A. Contractor shall provide site photographs or videotape, sufficiently detailed and described, of existing conditions of trees and vegetation, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing, tree pruning, or tree protection. Submit photographs or videotape to the Landscape Architect prior to commencement of Work.

B. Product Data: Submit complete and legible materials list of items to be provided for Work described herein this Section.

C. Submit complete detailed schedule and description of Work to be done within drip-line, (if any), including list of equipment to be used.

D. Submit schedule and description of proposed pruning and/or other remedial work to existing plant materials. Submit qualifications describing years of experience and list of similar projects completed for the following:
1. A State of California licensed Pest Control Advisor shall propose application of all herbicides or pesticides.
2. A Certified Arborist shall propose pruning of trees or other vegetation. The Certified Arborist shall have a minimum of five (5) year's post-certification experience performing pruning and observation work for projects of comparable size with trees of similar size and nature.
3. Tree Pruning Company, and List of Certified Tree Workers, who will perform Work relating to requirements herein this Section. Tree Pruning Company shall have a minimum of five (5) years experience specializing in performing the work of this Section for projects of comparable size with trees of similar size and nature.

4. QUALITY ASSURANCE AND CONTROL

A. Pre-Installation Conference: Conduct conference at Project Site.

B. Pruning and remedial work shall be done under the direct supervision of an Arborist certified by the International Society of Arborists (ISA); or Arborist who is a member in good standing in the American Society of Consulting Arborists, in compliance with ISA and ANSI Standards.

Arborist shall be on Site continuously while existing trees or roots are being pruned or remedial work is being performed.

5. PROJECT SITE CONDITIONS

A. Contractor shall become aquatinted with existing site conditions, verifying quantities and locations of all protected trees and vegetation, and other information as may be necessary. Notify the Landscape Architect of unsatisfactory conditions, in writing, prior to commencement of Work.

B. Tree Flagging: Prior to commencement of Work, Contractor shall flag existing trees and vegetation to remain and protected throughout the duration of Work. Adequately flag tree trunks with bright-colored tape (neon colors preferred). Verify flagged trees and vegetation with the Landscape Architect.

C. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during tree-pruning or tree-protection operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from the Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways, if required, by authorities having jurisdiction.

D. Locate above utilities prior to any Work, and perform Work in a manner which will avoid possible damage. Notify utility locator service for area where Project is located before site clearing where applicable. Notify the Landscape Architect if conflicts exist.

E. Improvements on Adjoining Property: Authority for performing indicated removal and alteration Work on property adjoining Owner's property shall be obtained by the adjoining property Owner(s) prior to commencement of Work.

F. Protect existing Work and Work of other trades: Damage to existing construction caused by Work of this Section shall be promptly repaired and/or replaced at the expense of the Contractor.

G. Environmental Requirements: Perform actual pruning operations (if needed) during those seasons suitable for the specific tree type, in accordance with locally acceptable horticultural practices.

H. Pre-Tree Pruning/Tree Protection Conference: Contractor shall conduct a Pre-Tree Pruning/Tree Protection Conference at the Project Site with Certified Arborist (who will be on-site supervising the Work of the Project) and the Landscape Architect.
   1. Contractor shall be responsible for notifying parties, in writing, at least seven (7) days in advance to schedule the Conference.
   2. Contractor shall provide to parties in attendance within seven (7) days a written legible inventory of Work to be accomplished, including species (botanical and common name), location, size, specific pruning needs or tree protection needs as identified during the Conference, recommended pruning or tree protection methods to meet the identified needs, and any additional conditions noted.

6. SCHEDULE

A. Install Tree Protection Barricades prior to commencement of Work.

B. Work shall be done according to approved Schedule.

7. GUARANTEE

A. Contractor shall Guarantee that plants covered under the Provisions of this Section shall be healthy and in a flourishing condition of active growth for two (2) years from the date of Final Acceptance.

B. Requirements of the guarantee shall apply if failure of the Contractor to take specified precautions and Work within restrictions of this Section contributes to the destruction, decline, or injury to a tree to remain, in the judgment of the Landscape Architect.

C. If a tree designated to be protected accordingly is destroyed or injured so that in the judgment of the Landscape Architect it should be replaced, it shall be removed at the expense of the Contractor. Contract shall pay compensation to the Owner of the property where the tree was located at the rate as specified herein this Section (see Compensation).

8. COMPENSATION

A. Contractor shall replace existing plant material designated to remain that dies or sustained injury from the result of the Contractor's negligence to provide adequate required protection, pruning, or maintenance during the course of construction operations.

B. Trees: Contractor shall thoroughly remove damaged tree, including trunk, branches, and roots, at no cost to the Owner, and at the direction of the Landscape Architect.
   1. Contractor shall furnish and install per requirements in Section 329300 – Exterior Plants, with an equal size tree (in height, spread, and caliper), and of the same form, species, and in the same quantity as those tree(s) that were damaged, at the direction of the Landscape Architect. Compensation shall include the actual cost of the item boxed out of the ground; transportation or delivery of boxed item to the site; unloading, planting and staking; maintenance, including watering, fertilizing, pruning, pest control, and other care to bring replacement to same general condition of the original item.

C. Other Plant Material (other than Trees): Contractor shall replace other vegetation (other than trees) that died or sustained injury from the result of the Contractor's negligence to provide adequate required vegetation protection, pruning, or maintenance during the course of construction operations. Compensation shall be awarded to the Owner as follows:
   1. Contractor shall thoroughly remove damaged vegetation at no cost to the Owner, and at the direction of the Landscape Architect.
   2. Contractor shall furnish and install per requirements in Section 329300 – Exterior Plants, with equal size plant material as those which damaged ((5) gallon container stock minimum (as applicable)) of the same form, species, and in the same quantity as vegetation that was damaged, at the direction of the Landscape Architect.

2.PRODUCTS

1. TREE PROTECTION MATERIALS

A. Barricade for Protection of Existing Vegetation:
   1. Fabric: Utility (snow) type fencing, minimum four-feet (4'-0") high, consisting of a vinyl meshed fabric in a bright orange color. Fabric shall be approved by the Landscape Architect.
   2. Posts: Metal or wood, sufficient in gauge (as appropriate) and size to support the fabric material in a taut and plumb condition. Posts shall be subject to approval by the Landscape Architect.
   3. Signs: Posted plastic laminated signs, attached to fabric fencing, with words "WARNING-KEEP OUT-TREE PROTECTION ZONE".

B. Mulch: Where available, Contractor shall stockpile and reuse shredded wood chips produced from on-site tree removals and remedial work, if chips are disease free and acceptable to the Landscape Architect. Where on-site chips are not available, Contractor shall provide Shredded Wood Mulch as specified in Section 329400 – Landscape Planting Accessories.

3.EXECUTION

1. PREPARATION

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

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.

2. TREE AND VEGETATION PROTECTION

A. Protect existing trees and other vegetation indicated to remain in place against the following:
   1. Storage or parking of automobiles or other vehicles.
   2. Stockpiling of building materials, refuse, or excavated materials.
   3. Use of trees as support posts, power posts, or sign posts, anchorage for ropes, guy wires, or power lines, or other similar functions.
   4. Dumping of poisonous materials on or around plant roots, trunks, branches, or foliage. Such materials include, but are not limited to, paint, petroleum products, dirty water, or other deleterious materials.
   5. Cutting, breaking, or shinning of roots caused by utility trenching, foundation digging, placement of curbs and trenches, and other miscellaneous excavation without prior written approval by the Landscape Architect.
   6. Damage by skinning or bruising of bark on trunks or branches, caused by maneuvering vehicles or stacking material or equipment too close to the plant.

7. Compaction of the soil within the drip-line of the plants due to movement of trucks or grading machines, pedestrian or vehicular traffic, storage of equipment or materials.
8. Excessive water or heat from equipment, utility line construction, or burning of trash under or near vegetation to remain.
9. Damage to root system from flooding, erosion, and excessive wetting and drying resulting from watering and other operations.

B. Prior to commencement of construction activities, the Contractor shall erect and maintain a temporary fenced barricade around the drip-line of individual trees, around perimeter drip-line of groups of trees, or around other vegetation to remain.
1. Prevent damage to roots during installation of barricade posts. Space posts approximately 4'-0" on-center (O.C.) and securely attach fabric.
2. Barricades shall be installed plumb, taut, and sturdy to prevent unauthorized access around drip-line of trees and protected vegetation. Repair sagging or damaged barricades immediately.
3. Immediately after barricade fencing is installed, cover entire soil area inside of the fence area with a four-inch (4") layer of mulch. Keep mulch eighteen-inches (18") away from root crown. Irrigate protected trees and vegetation to a moist soil depth of eighteen-inches (18") deep.
4. During the course of construction, relocation of the barricade may be required to facilitate construction. Contractor shall relocate barricade as directed by the Landscape Architect at no additional expense to the Owner.
5. Remove barricade when construction operations are complete or when directed by the Landscape Architect.

C. Irrigation: Contractor shall supply fresh potable water in adequate amounts and rates of application as required to maintain the health of protected plant material throughout the duration of the construction operations. Contractor shall maintain a watering schedule and document dates and duration of irrigation applications.
1. Construct a temporary watering basin, as required, on the surface of the existing undisturbed grade, with imported soil, to aid in the retention of water around existing protected trees and planting.

D. Do not excavate within drip line of trees, unless approved, in writing, by the Landscape Architect.

E. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
1. Cover exposed roots with burlap and water regularly.
2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
3. Coat cut faces of roots more than 1-1/2 inches in diameter with emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.

SECTION 26 0100

BASIC MATERIALS AND METHODS

PART 1: GENERAL

1.01 RELATED DOCUMENTSF

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.02 WORK INCLUDED

A. The specifications and drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material for the proper execution of the work in accordance with present practice of the trade shall not relieve the Contractor from providing such additional labor and materials.

B. All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of electrical system, complete, as shown on the drawings and/or specified herein. Work includes but is not necessarily limited to the following:

1. Conduits for all wiring systems, unless otherwise specifically noted.

2. All electrical wiring and connections to equipment furnished under other sections of Specifications.

3. All electrical wiring and connections to Owner furnished equipment.

4. Pull wires in conduit runs indicated as conduit only (CO).

5. Building electrical wiring, conduits, outlet boxes, junction boxes, convenience outlets, switches, plates and all miscellaneous items of electrical equipment, apparatus and material specified and/or shown on Drawings.

6. All required grounds.

7. All anchors, chases, sleeves and supports for electrical equipment.

9. Excavation necessary for execution and completion of electrical work.

10. Complete Fire Alarm and Detection System.

11. Tests of entire system.

12. Guarantees.

13. Shop Drawings.

14. In these specifications, Fire Alarm, Clock and Class Change Signal, PA/Intercom, Television, Intrusion Alarm, etc. are referred to as Auxiliary Systems or Signal Systems.

1.03 GUARANTEE

A. In addition to guarantee required in Division 01 or specifically specified elsewhere, all materials and equipment provided and installed under this Division of Specifications shall be guaranteed by Contractor in writing for a period of one year from date of acceptance of work by Owner. Should any trouble develop during this period due to defective materials or faulty workmanship, the Contractor shall furnish all necessary labor and materials to correct the trouble without costs to Owner.

B. Guarantee complete and perfect operation of entire system and that all apparatus will perform in accordance with detailed drawings and Specifications.

C. Guarantee that all equipment will be supported in such a way as to be free from objectionable vibration and noise.

D. Guarantee that all licenses and royalties for use of any patented feature of system will be paid before acceptance of system.

1.04 GENERAL REQUIREMENTS

A. Codes: Construct project in accordance with following codes and regulations.

1. 2022 California Electrical Code, Title 24 C.C.R.
(2017 National Electrical Code of the National Fire Protection Association, NFPA)

2. 2022 California Mechanical Code, Title 24 C.C.R.
(2018 Uniform Mechanical Code of the International Association of Plumbing and Mechanical Officials, IAPMO)

3. 2022 California Plumbing Code, Title 24 C.C.R.
(2018 Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials, IAPMO)

4. 2022 California Energy Code, Title 24 C.C.R.

5. 2022 California Fire Code, Title 24 C.C.R.
(2018 International Fire Code of the International Code Council)

7. 2022 California Existing Building Code, Title 24 C.C.R.
(2018 International Existing Building Code of the International Code Council, with amendments)

8. 2022 California Green Building Standards Code (CAL Green Code), Title 24 C.C.R.

9. 2022 California Referenced Standards Code, Title 24 C.C.R.

10. Local codes and ordinances.

11. Division of State Architect.

Keep a copy of applicable code available at Site while performing work of this Section. Nothing in these Drawings and Specifications to be construed as authority to violate codes and ordinances. Conflict with applicable regulations to be resolved at Contractor's expense before installation.

B. Permits, Fees and Inspections: Obtain and pay for all necessary permits and fees required by any constituted authority having jurisdiction including utilities. Arrange and pay for all required inspections or examinations and deliver certificates of inspection to Architect.

C. Record Drawings:

1. Provide record drawings for work of this Section.

2. Keep up-to-date a complete "As-Built" record set of blueline prints corrected daily and showing every change from original Drawings and Specifications and exact "As-Built" locations, sizes, and kinds of equipment.

3. Prints for this purpose may be obtained from Architect at cost of printing. Keep this set of Drawings on job and use only as a record set.

4. Drawings to serve as work progress sheets. Make neat and legible notations in red ink thereon daily as work proceeds, showing work as actually installed. Drawings to be available at all times for inspection, and kept at a location designated by Architect.

5. On completion of work, obtain one set of prints from Architect at cost of printing, and note neatly in scale all changes on record set. Deliver complete set of prints together with one set of blueline prints to Architect together with Contractor's name, address and phone number. Incorrect, non-legible or non-reproducible drawings will not be accepted.

D. Selection and Ordering of Equipment and Materials: Within two weeks after award of Contract, arrange for purchase and delivery of all light fixtures, equipment and materials required in ample quantities and at proper time. Inform Architect immediately of any inability to obtain suitable delivery of any equipment or material. Send copy of letter verifying date of purchases to Architect.

E. Shop Drawings and Material Lists:

1. Submit material lists and shop drawings as called for in Division 01, and as supplemented by this Division, and with sufficient promptness to ensure that overall work of project will not be delayed.

2. Submit six copies of a list of materials and equipment manufacturers that Contractor intends to use.

3. Provide shop drawings for following:

   a. Fire Alarm Devices.

   b. Fire Alarm Shop Drawings.

4. Do not fabricate work until reviewed shop drawings for work have been received from Architect. Work fabricated or erected in advance of reviewed shop drawings will be at risk of Contractor.

5. Architect's or Engineer's review of shop drawings does not relieve Contractor of responsibility for errors including details, dimensions, or materials, as well as conformance with requirements of Drawings and Specifications.

6. Shop drawings will be checked by Architect and Engineer for conformance to design as a convenience to Contractor. Dimensions will not be checked. Should interferences become evident, notify Architect immediately so that matter may be resolved prior to proceeding with fabrication.

7. No reimbursement based on a claim that work was placed in accordance with dimensions shown on a reviewed shop drawing will be allowed for removing or replacing work already in place.

8. Make available a copy of every reviewed shop drawing at Project Site.

9. Submit shop drawings in coherent groups; e.g., all lighting fixtures at one time.

10. Submit actual samples of specified equipment or material to Architect for review when requested.

F. Substitution and Approval of Material:

1. Base all bids and proposals only upon materials, construction and equipment named or described in specification and/or shown on drawing. Should a Contractor wish to use other equipment than that specified, he shall submit proposed substitution by fully describing equipment he prefers to use and by listing credit or additional cost to his bid as a separate item should substitution be acceptable.

2. All equipment and materials proposed for substitution shall be similar in design and equal in quality and function to those specified herein or on drawings. Contractor (not sales vendor) shall demonstrate his proposed substitution and shall specifically note all differences between item specified and proposed substitution. Actual samples and test data, certified by an independent testing laboratory, shall be submitted when requested.

3. Each substitution will be given consideration, but without any obligation expressed or implied on part of Architect to change named requirements of specification. Only one substitution for each item of equipment will be permitted. Contractor assumes sole responsibility for performance and space requirements for substitute equipment. Decision of Architect shall be final as to whether or not substitution is acceptable.

G. Terminology:

1. Term "provide" used on Drawings and elsewhere in the Specifications shall be considered to mean "furnish and install".

2. Term "UL" means Underwriters Laboratories Inc.

H. Workmanship: See supplementary Conditions, Architect is sole judge of whether execution is in a workmanlike manner.

I. Safety Conditions: Be responsible in preventing energized switches, circuit breakers or circuits from being turned to "On" position during construction period. Be responsible for damages to personnel and/or property resulting from contact with energized circuits, switches, circuit breakers, busses or other electrical apparatus. Construct all electrical work with electrical system de-energized in area. At no time permit work on equipment or apparatus with energized circuits.

J. Verification of Dimensions: All scaled and figured dimensions are approximate and are given for estimating purposes only. Before proceeding with work carefully check and verify all dimensions and sizes and assume all responsibility for fitting of materials and equipment to other parts of equipment and to structure. Where apparatus and equipment have been indicated on drawings, dimensions have been taken from typical equipment of class indicated. Carefully check drawings and see that equipment will fit into spaces provided.

K. Locations:

1. Locations of conduits, outlets, apparatus and equipment indicated on drawings are approximate only and shall be changed to meet architectural and structural conditions as required.

2. Install conduit and equipment in a manner and in locations avoiding all obstructions, preserving headroom, keeping openings and passageways clear and readily accessible for maintenance and repairs. Make changes in locations of conduit or equipment which may be necessary to accomplish this. Drawings are essentially diagrammatic to extent that many offsets, bends, special fittings and exact locations are not indicated. Examine all drawings prepared by manufacturers, suppliers and installers of all equipment including air conditioning and plumbing fixture shelving, for requirements and locations of equipment and outlets.

3. Should any structural interferences prevent installation of outlets, setting of cabinets for lighting panelboards, running of conduits, or installation of other electrical equipment at locations shown on Drawings, necessary minor deviations therefore as determined by Engineer may be permitted. In event changes in indicated locations or arrangements are necessary due to developed conditions in building's construction or rearrangement of furnishings or equipment, Owner shall be permitted to move any junction box or utility outlet a distance of 10' and such changes shall be made without extra cost providing change is ordered before work is installed. Submit an

estimate of cost or credit for other changes and proceed only upon written authority of Architect.

4. Be cautioned that diagrams showing electrical connections are diagrammatic only and must not be used for obtaining lineal runs of wiring or conduit. Wiring diagrams do not necessarily show exact physical arrangement of equipment.

5. Locations of outlets, lighting fixtures, cabinets, panelboards, apparatus, motors, mechanical equipment, etc., shown on Electrical Drawings is only approximate. Do not scale them from Electrical Drawings.

6. Verify locations of outlets, lighting fixtures, equipment etc., with Architectural Drawings of interior and exterior details and finish, and coordinate location of electrical work with mechanical and other equipment.

L. These Specifications and attendant Drawings are intended to cover a complete and operable electrical system. Follow Drawings and Specifications and execute all work according to true intent and meaning. Should any error or omission exist in either or both of these Drawings and Specifications, or conflict one with another, have same explained and adjusted by Engineer before submitting bid price for electrical work; otherwise at own expense, supply proper materials and labor to completely install same, make good any damage to or defect in work of results obtained therefore caused by such error, omission or conflict. Most restrictive, greater quantity or size, better quality or other superior condition of all representations shall prevail. It is intended that outlets be located symmetrical with Architectural elements notwithstanding fact that locations indicated on Drawings may be distorted for clarity.

M. Omission of expressed reference in Drawings or Specifications to any item of labor or material necessary for proper execution of work in accordance with present good practice of trade will not relieve Contractor from providing such additional labor and materials.

N. Job Visits by Engineer: Periodic visits to job by Engineer is for express purpose of verifying compliance by Contractor with contract documents. Such visits by Engineer shall not be construed as construction supervision. Neither shall such visits be construed to make Engineer responsible for providing a safe place for performance of work by Contractor or Contractor's employees or safety of supplies of Contractor or his subcontractors.

O. Cooperation with Others: Organize work that will harmonize with work of all trades so that all work may proceed as expeditiously as possible. Be responsible for correct placement of work and connection of work to all related trades.

P. Protection of Finish: Provide adequate means for protecting all finished parts of materials and equipment against damage from any cause during progress of work and until acceptance by Architect. Cover all material and equipment in storage and during construction in such a manner that no finished surfaces will be damaged, marred or splattered with paint. Keep moving parts perfectly clean and dry. No paint spraying will be permitted in building. Replace or refinish damaged material or equipment including face plates or panels without additional costs to Owner.

Q. Cleaning Equipment and Premises: Thoroughly clean all parts of materials, equipment and exposed parts such as receptacles and panelboards, of cement, plaster and other materials. Remove all oil and grease spots with a non-inflammable cleaning solvent. Brush exposed metal work with steel brushes to remove rust and other spots and leave smooth and clean. During progress of work, carefully clean up and leave premises and all portions of building free from debris. At completion of work, remove all waste materials and debris resulting, leaving everything in a complete and satisfactory condition.

R. Cutting and Patching: Include all cutting and patching in bid. Do not cut any structural members without first having received written permission from Architect. Cutting of round openings which can be done by use of a rotary drill shall be done by Contractor requiring same. Cutting and patching finish work shall be performed by workmen of the respective trade.

S. Conditions at Site: Visit Job Site and become familiar with all existing conditions within scope of work and include in Bid Proposal allowance for these conditions. Verify exact locations of services prior to construction. Notify all other Contractors of these utility locations.

T. Documents: Read all relevant documents, become familiar with job, scope of work, type of general construction, Architectural, Structural, Mechanical and Electrical Drawings and Specifications. Also become familiar with purpose for which these Drawings have been prepared and become cognizant of all details involved.

U. Acceptance: Before work will be accepted, demonstrate to Owner and Architect that entire installation is complete and in proper operating condition and Contract has been fully and properly executed. Following items shall be prepared and submitted to Architect:

1. Two copies of all test results required under this Division.

2. Two copies of local and/or state code enforcing authorities' final inspection certificates.

3. Copies of as-built record drawings as required.

4. Notify Architect in writing when installation is complete and that a final inspection of this work can be performed. In event defects or deficiencies are found during this final inspection they shall be corrected to satisfaction of Architect before final acceptance can be issued.

5. Two Maintenance and Operating Manuals as required.

V. Field Inspections: Provide proper facilities for access of Owner or Owner's representative to conveniently examine and inspect all portions of work covered in this Contract at any and all reasonable hours.

W. Completing Work: At completion of work, remove all waste materials and debris resulting from work, leaving everything in a complete and satisfactory condition.

X. Electrical Superintendent: Include services of a qualified electrical foreman capable of interpreting intent of Drawings and Specifications, to study Plans, Specifications and references, and coordinate all requirements with other trades, authorized to make decisions and issue instructions; be constantly in charge of work and available at job site at all times and at final inspection. Instruct Owner's representative for proper operation and recommend maintenance of all systems.

Y. Maintenance and Operating Manuals:

1. Before completion and acceptance of work, furnish Owner with two complete sets of operating and maintenance instruction manuals. Bind each set-in durable hardboard binder and index.

2. Compile data for manuals upon approval of material list and sketches so as not to delay final approval of work installed. Operating manuals to contain all pertinent data relating to electrical installation such as fixture cuts, manufacturer's approval, shop drawings, sketches, wiring diagrams and equipment operating instructions.

3. Instruct Owner's operating personnel with electrical operating procedures before work is considered complete.

Z. Extra Work or Costs to This Contractor Due to Other Contractors or Trades: Adjusted between this Contractor and offending Contractor at no extra cost to Owner. Notify Architect before such extra work is done.

AA. Tests:

1. Upon completion of work and adjustment of all equipment, all systems shall be tested under direction of Owner's representative to demonstrate that all equipment furnished and installed and/or connected under provision of these Specifications shall function electrically in manner required. All tests shall be completed prior to final inspection of project.

2. All systems shall test free from short circuits and grounds and shall be free from mechanical and electrical defects. All circuits shall be tested for proper neutral connection.

3. All instrumentation and personnel required for testing shall be furnished by Contractor.

BB. Noise Control:

1. Perform electrical work to a manner in minimize transmission of noise and preserve acoustical properties of building structure.

2. Where conduits pass through sleeves in interior walls, floors, or ceilings, completely fill space between each conduit and its sleeve to provide an airtight seal.

3. Use glass fiber material, "Duxseal" compound, for acoustic seals.

CC. Seismic Bracing Standards: All pipes, cable trays, conduits, etc. shall be supported and braced in accordance with construction documents.

DD. In hard ceiling space where access to j-boxes, detectors, etc is required, provide ceiling access panel, fire-rated typical.

END OF SECTION

SECTION 260519

WIRE AND CABLE-RATED 600 VOLT

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.02 DESCRIPTION

A. Work includes but is not limited to the following:

1. Building wire.

2. Ground Conductors.

3. Wiring connections and terminations.

4. Conductor Identification.

B. Related Work:

1. Section 260100 - Basic Materials and Methods.

2. Section 260533 - Conduit.

3. Section 260553 - Electrical Identification.

PART 2: PRODUCTS

2.01 BUILDING WIRE

A. Wires shall be single conductor type THHN or THWN insulated with polyvinyl chloride and covered with a protective sheath of nylon, rated at 600 volts. Wires may be operated at 90 degrees C. maximum continuous conductor temperature in dry locations, and 75 degrees C. in wet locations and shall be listed by UL Standard 83 for thermoplastic insulated wires, listed by Underwriters Laboratories (UL) for installation in accordance with Article 310 of the California Electrical Code (CEC). Conductors shall be solid copper for 12 AWG and smaller conductors, and stranded copper for 10 AWG and larger conductors. Conductors shall be insulated with PVC

and sheathed with nylon. Wires shall be identified by surface markings indicating manufacturer's identification, conductor size and metal, voltage rating, UL symbol, type designations and optional rating. Indentations for lettering are not permitted. Wires shall be tested in accordance with the requirements of UL standard for types THWN, or THHN.

B. Conductors shall be solid Class B or stranded Class C, annealed uncoated copper in accordance with UL standards, or another Nationally Recognized Testing Laboratory (NRTL).

C. Control Circuits: Copper, stranded conductor 600 volt insulation, THWN/THHN.

D. Minimum branch circuit wiring: No. 12 AWG copper, 600 volt insulation.

E. Minimum wire size except for control wiring: No. 14 AWG copper, 600 volt insulation.

2.02 GROUND CONDUCTORS

A. Equipment ground: Insulated conductor green in color.

B. Isolated circuit ground: Insulated conductor green in color.

C. Ground Wires: Bare copper or with green colored insulation.

2.03 CONDUCTOR ARRANGEMENT AND IDENTIFICATION

A. Ties: T & B "Ty-rap" or 3M Company.

B. Lacing: Nylon twine.

C. Markers: Adhesive type, Brady.

2.04 CONDUCTORS

A. All Wire: New and delivered to job site in unbroken packages.

B. Each package shall bear Underwriter's and Manufacturer's labels and seals indicating date of manufacture and maximum allowable voltage.

PART 3: EXECUTION

3.01 INSTALLATION

A. Wires shall not be installed until debris and moisture is removed from conduits, boxes, and cabinets. Wires stored at site shall be protected from physical damage until they are installed and walls are completed.

B. Wire-pulling compounds furnished as lubricants for installation of conductors in raceways shall be compounds approved and listed by UL, NRTL, or equal. Oil, grease, graphite, or similar substances are not permitted. Pulling of 2 AWG or larger conductors shall be performed with a cable pull machine. Any runs shorter than 50 feet are exempt. When pulling conductors, do not exceed manufacturer's recommended values

C. At outlets for light, power, and signal equipment, pigtail splices with 8-inch circuit conductor leads for connection to fixtures, equipment, and devices.

D. Pressure cable connectors, pre-insulated 3M Scotchlok, Hubbell Power, O-Z/Gedney or equal, Y, R or B spring-loaded twist-on type, may be furnished in splicing number 8 AWG or smaller wires for wiring systems; except public address and telephone systems.

E. Joints, splices, taps, and connections to switchboard neutral, bonding or grounding conductors, conductors to ground busses, and transformer connections for wires 6 gage and larger shall be performed with high-pressure cable connectors approved for installation with copper conductors. Connectors shall be insulated with heavy wall heat shrink WCSM, or cold-applied roll-on sleeve RVS. Insulation level shall be a minimum of 600V and joints, splices, and taps shall be qualified to ANSI C 119.1, UL, NRTL, or equal listed mechanical pressure connections.

F. Connections to any bussing and high-press cable connectors shall be securely bolted together with corrosion-resistant plated carbon steel, minimum grade five machine screws secured with constant pressure-type locking devices.

G. Connection of any bonding or grounding conductors shall be securely bolted together with corrosion-resistant plated carbon steel, minimum grade five machine screws secured with constant pressure-type locking devices.

H. Wire switchboards, panel cabinets, pull boxes, and other cabinets except public address, shall be neatly grouped and tied in bundles with nylon ties at 10-inch intervals. In switchboards, panels and terminal blocks, wires shall be fanned out to terminals. If bundles are longer than 24 inches, a maximum of nine current carrying conductors may be bundled together.

I. Install conductor lengths with a minimum length within the wiring space. Conductors must be long enough to reach the terminal location in a manner that avoids strain on the connecting lug.

J. Maintain the conductor required bending radius.

K. Neutral conductors larger than 6 gage, which are not color identified throughout their entire length, shall be taped, painted white or natural gray, or taped white where they appear in switchboards, cabinet, gutters or pull boxes. Neutral conductors 6 gage and smaller shall be white color identified throughout their entire length.

L. Fire alarm and clock wiring shall be continuous from terminal cabinets or from equipment to each device. Splices are not permitted between devices and/or terminal cabinets at junction and pull boxes. Wiring shall be terminated at terminal blocks or devices only.

M. Wiring systems shall be free from short circuits and grounds, other than required grounds. The contractor shall be responsible for the testing of feeder and branch circuit conductor's insulation resistance. The insulation of the conductors shall be tested prior to connections to any panelboards, switchboards, variable frequency drives, lighting control systems, ballasts, and wiring devices such as but not limited to GFI receptacles, TVSS receptacles, or equipment. Insulation testing of panelboards and switchboards shall be independently performed from the insulation testing of any conductors as specified in other sections of this specification.

1. Utilize the services of an approved independent testing laboratory to perform megger time-resistance insulation testing of feeder conductors. Tests must be conducted with wires disconnected at both ends.

    a. Provide calibration program records to assure the testing instrument to be within rated accuracy. The test equipment accuracy shall be in accord with the requirements stated by the National Institute of Standards and Technology (NIST).

    b. Test equipment shall be provided with a label stating the date of last calibration. As a minimum the equipment shall have been calibrated within the past 12 months.

    c. Test reports shall include the following:

        1) Identification of the testing organization.
        2) Equipment identification.
        3) Ambient conditions.
        4) Identification of the testing technician.
        5) Summary of project.
        6) Description of equipment being tested.
        7) Description of tests.
        8) Test results.
        9) Analysis, interpretation and recommendations.

3.02 COLOR CODES

A. Signal Systems: Wires for signal systems shall be color-coded. Except where otherwise specified, color-coding shall be as follows:

SYSTEM	COLOR CODE
Fire Alarm Speakers	Pink (+) and Gray (-)
Fire Alarm Strobes	Orange (+) and Blue (-)
Un-Interruptible 24 Volt Power (Annunciator, Water Flow, and Audible Device)	Yellow (+) and White (-) Note: A single white wire may be common to both
Interruptible 24 Volt Power (4 wire smoke detectors, duct detectors)	Brown (+) and White (-) Note: A single white wire may be common to both
Switch-Leg Sprinkler Bell (Between water flow and audible device)	Violet (+) and White (-)
Door Holding Magnets (Non Power Limited)	Black (+) and White (-)

3.03 TAPE AND SPLICE KITS

A. Splices, joints, and connectors joining conductors in dry and wet locations shall be covered with insulation equivalent to that provided on conductors. Free ends of conductors connected to energized sources shall be taped. Voids in irregular connectors shall be filled with insulating compound before taping. Thermoplastic insulating tape approved by UL, NRTL, or equal for installation as sole insulation of splices shall be furnished and shall be installed according to manufacturer's printed specifications.

3.04 PROTECTION

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

3.05 CLEANUP

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

END OF SECTION

SECTION 260526

GROUNDING AND BONDING 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 methods and materials for grounding systems and equipment:
   1. Underground distribution grounding.
   2. Common ground bonding with lightning protection system.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:

   1. Test wells.
   2. Ground rods.
   3. Ground rings.
   4. Grounding arrangements and connections for separately derived systems.
   5. Grounding for sensitive electronic equipment.

C. Qualification Data: For testing agency and testing agency's field supervisor.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

   1. Instructions for periodic testing and inspection of grounding features at test wells, ground rings, and grounding connections for separately derived systems based on NFPA 70B.

a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
b. Include recommended testing intervals.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Bare Grounding Conductor and Conductor Protector for Wood Poles:

1. No. 4 AWG minimum, soft-drawn copper.
2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir or cypress or cedar.

D. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches in cross section, unless otherwise indicated; with insulators, or as shown on drawings.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 5/8 by 96 inches in diameter.

B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 1 inch, minimum, from wall 6 inches above finished floor, unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or

plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.

C. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at

closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.

1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

F. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

H. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of 20 feet, or as noted on drawings, of bare copper conductor not smaller than No. 2/0 AWG.

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

C. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

D. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.

2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 5 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 5 ohms.
5. Substations and Pad-Mounted Equipment: 5 ohms.
6. Manhole Grounds: 10 ohms.

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

B. Related Sections include the following:

1. Division 26 Section "Vibration And Seismic Controls For Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.04 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force or as directed by structural engineers specification, whichever is greater.

1.05 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

C. Welding certificates.

1.06 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.07 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

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

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.; a division of Cooper Industries.
    c. ERICO International Corporation.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut; Tyco International, Ltd.
    g. Wesanco, Inc.

3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Galvanized steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

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

1) Hilti Inc.
2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

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

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.01 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.02 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, raceways may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4

inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.

6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69..
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

3.04 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 260533

CONDUIT

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.02 DESCRIPTION

A. Work includes but is not limited to the following:

1. Rigid metal conduit and fittings.

2. Intermediate metal conduit and fittings.

3. Electrical metallic tubing and fittings.

4. Flexible metal conduit and fittings.

5. Liquidtight flexible metal conduit and fittings.

PART 2: PRODUCTS

2.01 RIGID STEEL CONDUIT AND FITTINGS

A. Rigid Steel Conduit: Hot dipped galvanized inside and out, galvanized threads, mild steel, zinc coated, inside and outside protective coating. Standard lengths: 10'-0".

B. Bushings: Threaded insulated metallic type except sizes 1" and smaller may be non-metallic type. Setscrew bushings are not acceptable.

C. Couplings, elbows, bends and other fittings: Same material and finish as rigid steel conduit. All shall be threaded type.

2.02 RIGID ALUMINUM CONDUIT AND FITTINGS

A. Conduit: Extruded from 6063-T24 alloy of maximum 1/10% copper content and containing lubricating inside liners; rigid threaded type.

B. Bushings: Insulated metallic except that sizes 1" and smaller may be non-metallic.

2.03 INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

A. Conduit: Galvanized steel, zinc coated, protective coating inside and out.

B. Fittings and Conduit Bodies: Use fittings and conduit bodies specified above for rigid steel conduit.

C. Conduit: May be used in lieu of rigid steel conduit where permitted by code, except in concrete, underground, runs longer than 100 feet for all power feeders with conduit greater than 2 inches.

2.04 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. Conduit: Hot dipped galvanized or sherardized inside and out, zinc coated with protective enamel coating inside. Provide bushings at ends of conduits.

B. Connectors: Steel, insulated, bused tap-on or wrench tightened compression type. (Couplings similar) Indentor or screw type not acceptable.

C. Conduit: May be used in lieu of rigid steel conduit where permitted by code, except exposed, in concrete and for runs more than 100' for all power feeders with conduit greater than 2 inches.

2.05 FLEXIBLE METAL CONDUIT AND FITTINGS

A. Conduit: Steel single strip, hot dipped galvanized on all 4 sides prior to fabrication. Flexible aluminum conduit will not be allowed.

B. Connectors: Die cast with ridges that thread into conduit. (Binding screw type connectors are not acceptable.)

C. Conduit: May be used in lieu of rigid steel conduit where specifically indicated; at connections to vibrating equipment; at drops to light fixtures from J-boxes; at locations judged by Architect impractical to use rigid conduit. Maximum length for any application shall be 6 feet.

2.06 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

A. Conduit: Steel, single strip, hot dipped galvanized on 4 sides prior to fabrication.

B. Connectors: Insulated, special Appleton "STN" Series.

C. Jacket: Liquidtight, polyvinyl chloride plastic.

D. Conduit: Use for final connection to motor terminal boxes and transformers. Use at exterior locations, damp locations, wet locations and for flex connections in kitchen, restrooms and similar areas.

2.07 CONDUIT SUPPORTS

A. Conduit Clamps, Straps, and Supports: Steel or malleable iron. Clamps: Unistrut Nos. P111 thru P1124, Kindorf No. C105. Straps: One or two hole as required.

B. Conduit hangers, racks and trapezes: Steel, threaded rods, channel iron "U" shaped racks equal to "Unistrut".

C. Individual conduit hangers: Steel, threaded rods with malleable iron split rings.

D. Hanger rods: 3/8" minimum diameter for 2" and smaller conduit, factory made. 1/2" minimum for 2-1/2" and larger conduit.

E. Wire supports: 12-gauge zinc coated iron tie wire, or 16 gauge galvanized double annealed steel tie wire.

2.08 CONDUIT PULLING CORDS

A. Pull Wire: No. 12 galvanized iron or nylon pull wire rated 250 pounds tensile strength.

2.09 CONDUIT FITTINGS, ELLS AND BUSHINGS

A. Special conduit fittings: Crouse-Hinds "Condulets" or Appleton "Unilets".

B. Ells: Same quality, same finish and same make as conduit.

C. Bushings: Thomas & Betts or approved equal.

D. Seismic separations and expansion joints: OZ type "AX" complete with bonding strap and clamps. At exterior locations use OZ type "EX".

2.10 CONDUIT SEALS AND SEALING COMPOUND

A. Vertical seals: Crouse Hinds type "EYD" or Appleton type "SF".

B. Horizontal Seals: Crouse Hinds type "EYS" or Appleton type "ESU".

C. Sealing compound: Crouse Hinds "CHICO" or Appleton "APELCO".

D. Fireproofing Compound: Dow Corning No. 3-6548 RTV or equal by 3M Company or Nelson.

2.12 MC CABLE

A. Metal Clad (MC) cable system is not allowed.

PART 3: EXECUTION

3.01 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

A. Arrange conduit to maintain headroom and present a neat appearance.

B. Unless indicated otherwise, conceal conduit within or behind finished walls and ceiling.

C. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.

D. Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.

E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.

F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.

G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.

H. Do not support conduit from any equipment subject to vibration. Support from structural members only.

I. Structural Considerations for Conduit Routing:

1. Where conduits are to pass through or will interfere with any Structural member, or where notching, boring or cutting of the structure is necessary, or where special openings are required through walls, floors, footings, or other buildings elements, to accommodate the electrical work, such work shall conform to State Building Code.

2. Where conduits are terminated in groups at panelboards, switchboards and signal cabinets, etc., provide templates or spacers to hold conduits in proper position and to preserve alignment. Conduits terminating at signal cabinets shall enter cabinets in following approved locations only: Conduits entering top, side, and bottom of cabinets shall be aligned in a single row, centered 2" from rear of cabinet; conduits entering back of cabinet shall be aligned in a single row centered 2" from top of cabinet. Conduits shall not be spaced closer than 3" on centers.

3. 1" and smaller conduits above metal lath ceilings shall be tied to ceiling channels. 1-1/4" conduits above metal lath ceilings shall be rigidly suspended with pipe hangers or pipe racks or shall be secured to superstructure with factory made pipe straps. Conduits in metal lath or steel stud partitions, shall be tied to furring channels or studs. In ceiling spaces and in partitions, tie wires shall be spaced not more than 5'-0" apart, shall hold conduit tight against channels and studs at point of tie and shall not bear any of weight of conduit. Tie wire shall be #16 gage galvanized double annealed steel tie wire.

4. Where auxiliary supports, saddles, brackets,, etc., are required to meet special conditions they shall be made rigid and secure before conduit is attached thereto.

5. Conduit in ceiling spaces, in stud walls and under floors shall be supported with factory made pipe straps or shall be suspended with pipe hangers or pipe racks. Pipe straps shall be attached to and shall hold conduit tight at point of support against ceiling and floor joists, rafters, and wall studs, or 2" x 4" headers fitted between joists or wall studs.

6. Conduits installed on exposed steel trusses and rafters shall be fastened with factory made conduit straps or clamps which shall hold conduit tight against supporting member at point of support.

7. Conduits under buildings shall be strapped with factory made conduit straps to underside of concrete floor or joists, or wood floor joists, or shall be suspended with pipe hangers or pipe racks. Conduits under building shall not rest on ground but shall be suspended from building or shall be buried below surface of ground. 1" and larger conduits under buildings shall be suspended with conduit hangers or racks.

8. Pipe hangers for individual conduits shall be factory made, consisting of a pipe ring and threaded suspension rod. Pipe ring shall be malleable iron, split and hinged, and shall securely hold conduit, or shall be spring able wrought steel. Rings shall be bolted to or interlocked with suspension rod socket.

Rods shall be 3/8" for 2" conduit hangers and smaller and shall be 1/2" for 2-1/2" conduit hangers and larger.

9. Factory-made pipe straps shall be one or 2-hole formed galvanized clamps, heavy duty type, except where otherwise specified.

10. Hangers straps, rods, or pipe supports under concrete shall be attached to inserts set at time concrete is poured. Under wood use bolts, lag bolts, or lag screws; under steel joists or trusses use beam clamps.

3.02 CONDUIT INSTALLATION

A. Cut conduit square using a saw or pipe cutter; de-burr cut ends.

B. Bring conduit to the shoulder of fittings and couplings and fasten securely.

C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.

D. Install no more than equivalent of two 90- degree bends between boxes for conduits 2" diameter and larger, three for conduit under 2" diameter. Locate pull boxes as required.

E. Use conduit bodies to make sharp changes in direction, as around beams.

F. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch size.

G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

H. Support rigid, intermediate and thin wall conduit at 8'-0" maximum on centers and 3'-0" from junction boxes.

I. Support flexible and liquidtight flexible conduit at 4'-0" maximum on centers and 12" from junction boxes.

J. Provide No. 12 AWG insulated conductor or suitable pull string in empty conduit, except sleeves and nipples.

K. Install expansion-deflection joints where conduit crosses building expansion or seismic joints.

L. Where conduit penetrates fire-rated walls and floors, seal opening around conduit with UL listed fire barrier, "3M" calk or equal.

M. Route conduit to roof mounted devices and equipment through roof jacks. Provide flashing/roof jacks for all new and existing conduits which penetrate roof to appropriate Roofing Section(s) for installation.

N. Run conduit to equipment on roof concealed in attic space. Penetrate roof at equipment locations only.

O. For conduits to roof mounted HVAC equipment, penetrate roof with roof jacks outside footprint of HVAC units. Do not penetrate roof inside HVAC units.

P. Do not use aluminum conduit below grade, cast in concrete or in masonry in contact with earth.

Q. Cut threads on rigid conduit to standard taper and to a length such that all bare metal exposed by threading operation will be completely covered by couplings or fittings used. In addition, cut lengths of thread such that all joints will become secure and wrench tight just preceding point where conduit ends would butt together in couplings and where conduit ends would butt into ends or shoulders of other fittings. Securely tighten all threaded connections.

R. Make joints in rigid conduit installed in concrete or masonry liquid-and-gas-tight, with red lead and oil, or other approved joint compound and engage not less than five threads.

S. Keep bends and offsets in conduit runs to an absolute minimum. Replace all deformed, flattened or kinked conduit. Provide large radius factory made bends or power bend rigid metal conduit of 1-1/4" trade size or larger.

T. Penetration Membrane: Where penetration cannot be avoided, cut and re-seal membrane at point of penetration.

U. Run exposed conduit parallel with or at right angles to building line, beams, or ceilings. Place symmetrical bends or metal boxes at changes in direction or taps.

V. Stub from each panel which is flush mounted in a wall, from top of panel a minimum of 3-3/4" conduits to nearest ceiling space or other accessible locations and cap for future use. Tag to indicate panel origination.

W. Independently support conduit rising from floor for motor connections if over 24" above floor. Support shall not be a motor or duct work which may transmit vibrations.

X. Provide pull wire in all conduit runs indicated as conduit only (C.O.).

Y. Do not run conduit closer than 12" to any hot water pipe, steam pipe, heater flue or vent.

Z. Terminate conduit stub-ups through floor for connection to equipment of junction boxes in couplings flush with top of concrete slab floor.

AA. Use rigid metal conduit where legally required, where exposed to weather, where located in unheated areas, or where subject to mechanical injury, here defined as exposed conduit less than 7'-6" above floor in areas accessible to anyone other than authorized operating or maintenance personnel.

BB. Where a conduit from one structure crosses to another structure, e.g., from a building to an arcade or from one arcade to another arcade, use a section of liquid-tight flex conduit at the crossing with sufficient slack to allow the two structures to move during an earthquake without breaking the conduit. For stub up to relocatable buildings, provide liquid-tite flex from stub up to first box on back of building.

CC. Provide a green insulated ground wire in all flexible conduit runs regardless of length.

DD. Install an equipment ground (green) insulated conductor in each non-metallic conduit.

EE. Flash and counter flash all conduit runs passing through roof.

FF. Use electrical metallic tubing above grade in dry locations only and where not subject to mechanical injury or otherwise prohibited. Concrete and masonry in contact with earth are not considered dry locations.

GG. Use liquid tight flexible conduit for final connections to motors and vibrating equipment. Use flexible conduit where required for equipment servicing for connections to recessed lighting fixtures from nearby accessible junction boxes, and for concealed runs in dry locations where structural conditions prevent use of other types of conduit.

HH. Size all conduits as legally required or larger where indicated or preferred. Where portions of a conduit run are increased in size, for whatever reason, make all remaining portions in that run same size.

II. Do not cut concrete, masonry or structural members except where approved by Architect.

END OF SECTION

SECTION 260534

BOXES

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specifications collectively apply to work of this Section.

1.02 DESCRIPTION

A. Work includes but is not limited to the following:

1. Wall and ceiling outlet boxes.

2. Pull and junction boxes.

3. Sealant.

B. Related Work:

1. Section 260100 - Basic Materials and Methods.

2. Section 260533 - Conduit

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS-OUTLET BOXES

A. Raco

B. Steel City

C. Bowers

2.02 OUTLET BOXES

A. Sheet Metal Outlet Boxes: One piece galvanized, pressed steel, knockout type, 4-11/16" sq. by 2-1/8" deep in all locations unless otherwise indicated or required.

B. Cast Boxes: Aluminum, or Cast ferroalloy, deep type, gasketed cover, threaded hubs.

C. Where Wiremold type box have to be used, e.g., on existing concrete wall, provide proper box such that the total depth of a box including the device mounted on the box, will not exceed 4 inches.

2.03 PULL AND JUNCTION BOXES

A. Interior and non-weatherproof boxes shall be constructed of blue or galvanized steel with ample laps, spot welded, and shall be rigid under torsional and deflecting forces. Boxes shall have auxiliary angle iron framing where necessary to ensure rigidity. Covers shall be fastened to box with a sufficient number of brass machine screws to ensure continuous contact all around. Flush type boxes shall be drilled and tapped for cover screws at Site if boxes are not installed plumb. All surfaces of pull and junction boxes and covers shall be given one coat of metal primer, and one coat of aluminum paint.

B. Weatherproof pull and junction boxes shall conform to foregoing for interior boxes with following modifications: Cover of flush mounting boxes shall have a weather-tight gasket cemented to and trimmed even with cover all around. Surface or semi-flush mounting pull and junction boxes shall be UL approved as rain-tight and shall be complete with threaded conduit hubs. All exposed portions of boxes shall be galvanized and finished with a prime coat and coat of baked-on gray enamel.

C. All junction and pull-boxes shall be rigidly fastened to the structure and shall not depend on conduits for support.

D. Cast Metal Boxes for Outdoor and Wet Location Installations: Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as rain-tight. Galvanized cast iron OR Cast aluminum box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

2.04 ACCEPTABLE MANUFACTURERS-SEALANT

A. Crouse Hinds "CHICO"

B. Permacel

C. Ductseal

2.05 ACCEPTABLE MANUFACTURERS - FIRE PROOFING SEALANT

A. Dow Corning

B. 3M Company

C. Nelson

PART 3: EXECUTION

3.01 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify exact location of floor boxes and outlets in offices and work areas with Owner's representative prior to rough-in.

C. Locate and install boxes to allow access.

D. Locate and install to maintain headroom and to present a neat appearance.

3.02 OUTLET BOX INSTALLATION

A. Unless otherwise noted on plan or specifically allowed by the Engineer, conceal all boxes flush in wall or in ceiling space above drop ceiling. In finished areas and where it is not possible to conceal conduits and boxes, for example, on existing concrete wall, provide Wiremold type metallic surface raceways and boxes.

B. Do not install boxes back-to-back in walls. Provide minimum 6 inch separation, except provide minimum 24 inch separation in acoustic-rated walls.

C. Provide knockout closures for unused openings.

D. Support boxes independently of conduit except for cast box that is connected to two rigid metal conduits, both supported within 12 inches of box.

E. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

F. Install boxes in walls without damaging wall insulation.

G. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

H. Position outlets to locate lighting fixtures as shown on reflected ceiling plans.

I. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed lighting fixture, to be accessible through lighting fixture ceiling opening.

J. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs. Accurately position to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes. Install plaster rings to interface with equipment to be mounted thereon.

K. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

L. Provide cast outlet boxes in exterior locations and wet locations. Provide cast bell-boxes at interior locations where box is exposed to view. (do not use regular 4/s or handy box with exposed knockouts and unfinished appearances for these interior exposed applications).

M. Where boxes are installed in fire rated ceiling or walls, be responsible for preserving integrity of fire rating as required.

N. In fire-rated wall, use 4" square deep boxes. Do not aggregate more than 100 square inches of boxes for any 100 square feet of wall or partitions. Separate outlet boxes on opposite sides of walls or partition by a minimum horizontal distance of 24 inches. Where the separation cannot be achieved due to site condition, provide 2-hour rated fire-proof material behind boxes to maintain fire rating of walls.

3.03 PULL AND JUNCTION BOX INSTALLATION

A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.

B. Support pull and junction boxes independent of conduit.

END OF SECTION

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Identification for raceway and metal-clad cable.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.03 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.04 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145.

1.05 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Color for Printed Legend:

1. Power Circuits: Black letters on an orange field
2. Legend: Indicate system or service and voltage, if applicable.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.02 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking nylon tie fastener.

E. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.03 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.04 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.05 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.06 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb, minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. Paint: Paint materials and application requirements are specified in Division 09 painting Sections.

1. Exterior Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry):

a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Exterior concrete and masonry primer.
2) Finish Coats: Exterior semigloss acrylic enamel.

2. Exterior Concrete Unit Masonry:

a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a block filler.

1) Block Filler: Concrete unit masonry block filler.
2) Finish Coats: Exterior semigloss acrylic enamel.

3. Exterior Ferrous Metal:

a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Exterior ferrous-metal primer.
2) Finish Coats: Exterior semigloss alkyd enamel.

4. Exterior Zinc-Coated Metal (except Raceways):

a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Exterior zinc-coated metal primer.
2) Finish Coats: Exterior semigloss alkyd enamel.

5. Interior Concrete and Masonry (Other Than Concrete Unit Masonry):

a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Interior concrete and masonry primer.
2) Finish Coats: Interior semigloss alkyd enamel.

6. Interior Concrete Unit Masonry:

a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a block filler.

1) Block Filler: Concrete unit masonry block filler.
2) Finish Coats: Interior semigloss acrylic enamel.

7. Interior Gypsum Board:

a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Interior gypsum board primer.
2) Finish Coats: Interior semigloss acrylic enamel.

8. Interior Ferrous Metal:

a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Interior ferrous-metal primer.
2) Finish Coats: Interior semigloss acrylic enamel.

9. Interior Zinc-Coated Metal (except Raceways):

a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Interior zinc-coated metal primer.
2) Finish Coats: Interior semigloss acrylic enamel.

C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.01 APPLICATION

A. Raceways and Duct Banks More Than 600 V Concealed within Buildings: 4-inch-wide black stripes on 10-inch centers over orange background that extends full length of raceway or duct and is 12 inches wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- high black letters on 20-inch centers. Stop stripes at legends. Apply to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to raceways concealed within wall.
3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways and Metal-Clad Cables More Than 600 V: Identify with "DANGER-HIGH VOLTAGE" in black letters at least 2 inches high, with snap-around labels. Repeat legend at 10-foot maximum intervals.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 20 A: Identify with orange self-adhesive vinyl tape applied in bands.

D. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands

1. Fire Alarm System: Red.
2. Fire-Suppression Supervisory and Control System: Red and yellow.
3. Combined Fire Alarm and Security System: Red and blue.
4. Security System: Blue and yellow.
5. Mechanical and Electrical Supervisory System: Green and blue.

6. Telecommunication System: Green and yellow.
7. Control Wiring: Green and red.

E. Power-Circuit Conductor Identification: For primary and secondary conductors No. 4 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

F. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use marker tape, marker labels, or write-on tags. Identify each ungrounded conductor according to source and circuit number.

G. Conductors to Be Extended in the Future: Attach write-on tags or marker tape to conductors and list source and circuit number.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

I. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply baked-enamel warning signs or metal-backed, butyrate warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access, with mechanical fastners.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

   a. Power transfer switches.
   b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

K. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer and load control.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Engraved, laminated acrylic or melamine label or Engraved, laminated acrylic or melamine label, attached with mechanical fasteners. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, stenciled legend 4 inches high, and attached with mechanical fasteners.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:

    a. Panelboards, electrical cabinets, and enclosures.
    b. Access doors and panels for concealed electrical items.
    c. Electrical switchgear and switchboards.
    d. Transformers.
    e. Electrical substations.
    f. Emergency system boxes and enclosures.
    g. Motor-control centers.
    h. Disconnect switches.
    i. Enclosed circuit breakers.
    j. Motor starters.
    k. Push-button stations.
    l. Power transfer equipment.
    m. Contactors.
    n. Remote-controlled switches, dimmer modules, and control devices.
    o. Battery inverter units.
    p. Battery racks.
    q. Power-generating units.

r. Voice and data cable terminal equipment.
s. Master clock and program equipment.
t. Intercommunication and call system master and staff stations.
u. Television/audio components, racks, and controls.
v. Fire-alarm control panel and annunciators.
w. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.
x. Monitoring and control equipment.
y. Uninterruptible power supply equipment.
z. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

3.02 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Color-Coding for Phase and Voltage Level, Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.

3. Colors for 480/277-V Circuits:

a. Phase A: Brown.
b. Phase B: Orange.
c. Phase C: Yellow.

4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Painted Identification: Prepare surface and apply paint according to Division 09 painting Sections.

END OF SECTION

SECTION 27 1500

STRUCTURED CABLING AND SPECIFICATIONS FOR VOICE/DATA AND SECURITY

PART 1 - GENERAL

1.01 GENERAL OVERVIEW

A. The work to be performed is for Rosemead School District's..

1.02 GENERAL REQUIREMENTS

A. The Scope of Work

1. Contractor shall provide all materials and labor to render data cabling systems and appurtenances, complete and operable for all equipment, and outlet locations of the buildings, as specified within this document and related drawings. Work includes, but not necessarily limited to the following:

A. Examine all other specification sections and drawings for related work required to be included as work under Division Twenty Six.

2. Contractor shall incorporate the horizontal distribution systems described in the specifications and drawings.

A. The Contractor shall provide all equipment, labor, materials, and services required for installing complete data cabling systems for all network systems. The installation shall be accomplished in accordance with this specification, and accompanying plans.

B. CODES AND STANDARDS

1. The Contractor shall adhere to all building, regulatory, and equipment standards applicable to the project. These standards shall include, but not be limited to the following:

A. Except as modified by governing codes and by the Contract Documents, comply with applicable provisions and recommendations of the following:

(1) The cabling and components shall carry Underwriters Laboratory (UL) Listing.

(2) National Electric Code (NEC), in particular, Sections 800-3(b) and 800-3(d).

(3) TIA/EIA-568B.1 Commercial Building Telecommunications Cabling Standards.

(4) TIA/EIA-568-B.1-1
Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements - Addendum 1 - Minimum 4-Pair UTP and 4-Pair ScTP Patch Cable Bend Radius (ANSI/TIA/EIA-568-B.1-1-2001)

(5) TIA/EIA-568-B.2-1
Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Components - Addendum 1 - Transmission Performance Specifications for 4-Pair 100 Ohm Category 6 Cabling (ANSI/TIA/EIA-568-B.2-1-2002)

(6) TIA/EIA-568-B.2-2
Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components - Addendum 2 (ANSI/TIA/EIA-568-B.2-2-2001)

(7) TIA/EIA-568-B.2-3
Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling - Addendum 3 - Additional Considerations for Insertion Loss and Return Loss Pass/Fail Determination (ANSI/TIA/EIA-568-B.2-3-2002)

(8) TIA/EIA-568-B.2-4
Commercial Building Telecommmications Cabling Standard - Part 2: Balanced Twisted Pair Components - Addendum 4 - Solderless Connection Reliability Requirements for Copper Connecting Hardware (ANSI/TIA/EIA-568-B.2-4-2002)

(9) TIA/EIA-568-B.3
Optical Fiber Cabling Components Standard (ANSI/TIA/EIA-568-B.3-2000)

(10) TIA/EIA-568-B.3-1
Optical Fiber Cabling Components Standard - Addendum 1 - Additional Transmission Performance Specifications for 50/125 um Optical Fiber Cables (ANSI/TIA/EIA-568-B.3-1-2002)

(11) TIA/EIA-455
Complete series for testing both Multimode and Single mode fiber optic cable.

(12) TIA/EIA 569B Commercial Building Standard for Telecommunications Pathways & Spaces.

(13) TIA/EIA 606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

(14) TIA/EIA 607-A Commercial Building Grounding and Bonding Requirements for Telecommunications

(15) IEEE Standards: 802 series.

(16) BiCSi TDB Manual; Building Industry Consulting Service International, Tampa, Florida.

(17) UCB ITS Standards for Identification and Administration.

(18) Apply for and acquire all required permits and inspections from regulatory agencies.

C. SUBMITTALS

1. Awarded contractor shall submit for approval within 10 calendar days, from date of award, all equipment and materials listing the manufacturer's catalog information for the following items:

A. List of materials for each item:

(1) Manufacturer

(2) Model Number

(3) UL listing

(4) Quantity

(5) Equipment Cut Sheets

(6) All wiring devices and termination hardware components.

(7) Cabling, indicating conformance with NEC/UL Listings and certifications.

(8) Modular data outlet connectors and wall plate assemblies.

(9) Submit a document indicating areas of usage of each wiring system employed.

(10) All electronic devices.

2. Shop drawings shall indicate equipment locations, wiring and schematics, details, panel configurations, sizes and a point-to-point-wiring diagram of all circuits. Shop drawings shall indicate interfaces to equipment

furnished by others, identifying numbers of wires, termination requirements, and other pertinent details. Responsibility for each end of interfaces shall be noted on shop drawings. Contractor shall supply shop drawings 1 week prior to installation.

3. Entire system shall be supported by engineering documentation including:

   A. Floor plans indicating conduit runs, conduit size, cable tray size, cable type, and cabinet.

   B. Riser diagrams indicating all devices, cabinets and they're point-to-point connections in a manner following floor plan layout.

4. Record Drawings:

   A. Submit five "As Built" marked up (E size) drawings for all as contractor installed cable and infrastructure. To include all conduit, underground, and above ground cable and pathways to/from for all buildings and each building floor. Deliver three "As Built" to the Architect.

   B. Submit a full size (E) drawing of plot plan and building plans, indicating location of conduit and cable runs. Architect shall provide contractor with background drawings. Contractor shall provide an AutoCAD drawing (v2000 or newer) displaying cable pathways used in their installation. This drawing shall be on a separate layer. It is to include conduit sizes, conduit runs, conduit ID number, number of cables and types in conduit, cable trays, cable type size, number of cables being carried, and the use of any inner duct. Contractor shall deliver one copy of the AutoCAD drawing on DVD and one plot of size E to the Director of Technology and same to Director of Facilities.

   C. Contractor shall provide a second AutoCAD drawing in a linear form of all cable runs from beginning to end point between MDF and IDF(s). This drawing does not use the Architects background. An example of the drawing can be found in the construction details.

D. QUALITY ASSURANCE

1. Contractor shall have completed at least 5 projects of equal scope to systems described herein and shall have been engaged in business of supplying and installing specified type of systems for at least 5 years.

2. Contractor shall warranty all work executed and materials furnished shall be free from defects of material and workmanship for a period of 1 year from acceptance date of Contract Completion. Immediately upon receipt of written notice from the District, Contractor shall repair or replace at no expense to the District - Any defective material or work which may be discovered before final acceptance of work, or within warranty period; any material or work damaged thereby; and adjacent material or work which

may be displaced in repair or replacement. Examination of or failure to examine work by the District shall not relieve Contractor from these obligations.

3. If Contractor fails to repair or replace material or work indicated above within 15 days of receiving written notice, the District, with its own personnel or by Contract, may proceed with repair or replacement and assess cost against Contractor, if Contractor does not respond accordingly.

4. Persons skilled in trade shall install system in accordance with best trade practice. Further, in accordance with all applicable building codes.

5. Contractor and all contractors' employees terminating cable to wiring terminating devices shall be certified by the manufacturer of the wiring device. Copies of certificates shall be provided to the District Representative prior to the start of work.

6. Contractor shall install stub ups for all MDF(s) and IDF(s) where cable penetrates the ceiling. Minimum conduit size is two inches. Separate stubs shall be supplied for fiber and copper cables.

7. Contractor shall label all reterminated cables at both ends regardless of contractor installed. Further, contractor shall label the associated workstation wall mounted faceplate, patch panel and the cable at the patch panel end for all reterminated cables.

E. ENGINEERING CONSIDERATIONS

1. The building/locations served shall be considered to have plenum air return and shall utilize a network of cable trays, conduit (overhead, interior to walls) and/or wire hanger routing for all data related cable installation. The contractor shall confirm that the installation shall adhere to all applicable building and fire codes including California Electric Code, Sections 800-3(b) and 800-3(d), and UL Listings.

2. The cable routing to all work locations shall be via floors, walls, and/or overhead conduits and cable trays as indicated on the plans. Data outlet locations shall be served from standard outlet boxes serving as multi-purpose communication outlets. The Contractor shall verify adequacy of cable routing systems being installed and notify the Owner's Representative of any potential conflicts for resolution prior to construction.

3. It is the responsibility of the Contractor to determine where to use "Plenum Cable". The network designer has provided a design that should not require plenum cable. Because of the limitations to check complete pathway routes, it is possible the contractor may need to modify the proposed route. If this route should be changed, then contractor shall supply a fully conduit pathway or plenum cable at no additional cost to the District.

F. DESIGN CRITERIA

1. Horizontal cable routing shall be through the use of overhead saddle hangers, raceways, conduits and/or cable trays, and/or wall conduits.

2. The contractor shall terminate all pairs to TIA/EIA 568B Standard configuration.

3. A cable management system shall be utilized for both fiber and copper cable. The management system shall be of sufficient type to facilitate future expansion. Contractor shall submit the selected cable management system with bid.

4. Contractor shall bond together all cable grounds to distribution rack, and bond rack to building electrical panel ground for ground continuity. Continuity shall be checked with an ohmmeter between adjacent components. Contractor shall submit written certification to the District that ohmmeter readings are no greater than one ohm.

5. Contractor installed equipment racks shall be placed 8 to 12 inches from ceiling. Contractor shall supply appropriate stub-ups or conduit to external pathways.

6. All data runs shall be with Category 6 UTP cable. Patch panel and all interconnecting devices shall be Category 6.

7. Contractor shall supply all necessary data/voice/IP Clock ports (Category 6) necessary to complete the job.

1.03 SITE REQUIREMENTS

A. Elementary School Sites

1. MDF Data: This MDF is existing on site.

B. The electrical contractor is responsible for installing all the conduit as specified in this specification and as shown in the construction project.

a. There are electrical power requirements that shall be installed regardless of whether it appeared in the electrical construction drawings or electrical specifications.

C. Install 24 strand fiber optic cable outdoor gel filled (see additional specifications below) from MDF to new IDF in new modular building. Install new hanger support system in Data MDF building from outside wall mount pull box to MDF room (supply similar to existing). Install 1-3”C stub up at MDF to facilitate fiber run to fiber termination enclosure. Install a new 48 port fiber termination enclosure into existing rack and terminate all 24 strands. Install new fiber optic in innerduct. All terminations shall be SC.

D. All fiber optic cable shall be installed in inner duct complete length. Contractor shall notify architect of possible pathway issues when using existing pathways.

E. Install one APC 3000 UPS (model no. SUA3000R2180). Rack mounted.

F. Install ground bus bar per construction drawings and ground to nearest ground. Bond all communications frames and equipment together and then to the communications ground bus bar.

B. Classroom Building

1. IDF – This IDF is existing.

A. Contractor shall install one power strip per description in the products section.

B. Install 144 port Category 6 patch panel with management support.

C. Install category 6 UTP from patch panel to all data locations per construction drawings.

D. Install B-66 blocks with M110 standoff at each floor and run station lines to each telephone access point. All cable shall have a 6 foot service loop to facilitate future reconnection for an IP Voice system. All station runs shall be category 6 UTP.

E. Install category 6 cable to all data access points per construction drawings. Terminate all runs to the first floor IDF.

F. Install category 6 cable to all voice access points per construction drawings. Terminate runs to the respective IDF floor.

G. Obtain sample to telephone handset before installing wall mounted access points. Call RSD maintenance for required input before proceeding. Telephone Handsets shall be provided by RSD.

PART 2 - PRODUCTS AND REQUIREMENTS

2.01 REQUIREMENTS FOR USING EQUIVALENT ITEMS IN PLACE OF SPECIFIED ONES

A. The contractor shall submit in sealed bid for District review any specifications on equivalent products that are being bid.

B. Equivalent products shall be prominently outlined in the bid.

2.02 COPPER CABLE

A. Premise (inside plant) copper cable for data is to be rated for IEEE 802.3 1000 Base T, non-plenum rated, Category 6, 4 twisted pairs, solid wire, 24 AWG, unshielded, shall be utilized in all buildings except in areas designated for plenum.

B. **Outdoor** Copper cable for data is to be rated for IEEE 802.3 1000 Base T, non-plenum rated, Category 6, 4 twisted pairs, solid wire, 24 AWG, unshielded.

C. Acceptable products – AT&T, Belden, Mohawk and General Cable.

D. Contractor shall leave 2 feet of slack at all MDF/IDF(s) locations for all Category 6 UTP cable.

2.03 CONDUIT GENERAL REQUIREMENTS & NOTICE

A. Contractor shall implement conduit-bending guidelines per TIA/EIA-569-B. "The inside radius of a bend in a conduit shall be at least 6 times the internal diameter. When the conduit size is greater than 50 mm (2 inches), the inside radius shall be at least 10 times the internal diameter of the conduit. For fiber optic cable, the inside radius of a bend shall always be at least 10 times the internal diameter of the conduit."

B. Contractor shall install bushings on all end pieces of conduit, whether existing or contractor installed, prior to pulling cables.

C. All ceiling, wall or floor penetrations designated for data shall be fire sealed regardless of whether contractor installed. Seals shall be airtight.

D. Firewall blocking material shall be installed for all core-drilled penetrations. Contractor shall follow the NEC, BiCSi TMD Building Manuals and manufacturer's procedures.

E. All new and existing conduits utilized in this installation for all sites shall be labeled. Contractor shall use a wire tag with indelible ink to identify conduits. Further, contractor shall note conduit ID on required submittals.

1. Contractor shall label all conduit at both ends utilized in this project. Label shall include the building designation as it appears on the construction drawing (to/from), etc., Bldg#/Room#/Conduit size.

2. Contractor shall utilize the 'Construction Drawings' for the type, amount and placement of raceways and conduits plus the addition of the below items in this section. Contractor shall utilize the 'Written Specifications' for the type, amount and placement of conduits (not raceways) when not covered by the 'Construction Drawings'.

F. All above grade conduit (exposed) and outdoors shall be ridged steel.

G. Contractor shall supply necessary conduit and all fittings from junction box to each building IDF(s) enclosure(s). Conduit shall be EMT inside and ridged steel for penetrations.

H. Contractor shall install conduit that stubs up from the IDF(s) enclosure(s) to ceiling space.

2.04 PATCH PANEL CABLES

A. Contractor shall supply 150 three-foot Category 6 patch cables terminated at both ends with a 4 pair, UTP, Category 6 jacks.

B. Contractor shall supply 50 six-foot Category 6 patch cables terminated at both ends with a 4 pair, UTP, Category 6 jacks.

2.05 WORKSTATION CABLES

A. Contractor shall supply 125 seven-foot Category 6 patch cables terminated at both ends with a 4 pair, UTP, Category 6 jacks.

B. Contractor shall supply 20 fourteen-foot Category 6 patch cables terminated at both ends with a 4 pair, UTP, Category 6 jacks.

C. Contractor shall supply 10 twenty-foot Category 6 patch cables terminated at both ends with a 4 pair, UTP, Category 6 jacks.

2.06 FIBER OPTIC PATCH CABLES

A. Contractor shall supply 12 three-foot Multimode patch cables, SC to SC.

B. Contractor shall supply 8 seven-foot Category Multimode patch cables, SC to SC.

2.07 DATA STATIONS:

A. Each four-pair 24 AWG data cable shall terminate on standard RJ-45 (8 position, 8 conductors) outlets at work locations and on the MDF/IDF termination data backboards as described above. Terminations shall be allocated to the MDF/IDF termination areas and use colored designation strips.

1. Workstation wiring. Standard wiring configuration for all work locations includes the following:

a. All cable termination devices shall be rated Category 6 or better. Device vendor must be the same as the one for patch panels.

b. Contractor shall install a mounted raceway system or equivalent per construction drawings. All category 6 UTP shall be terminated with the appropriate faceplate, at the modular plug (RJ-45).

c. Each data outlet shall be wired from the IDF as indicated in the construction drawings with individual 4-pair Unshielded Twisted Pair (UTP) "Category 6" cable.

d. The TIA/EIA 568B wiring configuration standard shall be adhered to for all data outlets.

e. Faceplate color shall match existing electrical plates.

f. All individual cable drops shall be terminated on faceplates with data connectors.

2. Cable placement above ground level: All cabling shall be suspended from the deck above by wires independent of all other trades. In no instance shall any cable be tied off to any other trade including but not limited to the following: sprinkler heads or pipe, electrical conduit or the wires used to suspend the conduit, HVAC ducting, or ceiling grid wires. In no case shall cable be left lying on the ductwork or on the ceiling grid. At minimum, cable shall be tied off to wires independent of all other trades approximately every four feet, or as required by Code, as it runs through the attic space.

3. Cable placement below ground level: All cabling shall be enclosed in conduit or placed in approved modular floor ducting system.

4. Splicing: Each run of cable between the termination block and the workstation outlet shall be continuous without any joints or splices.

B. The Contractor shall provide hardware and cable dressing to be consistent with layout and appearance to acceptable communications industry standards for a "neat" installation.

2.08 FIRE STOPPING MATERIAL

A. Fire stopping material shall be installed/applied to all core drills/wall penetrations. Fire stopping material shall meet ASTM E814; acceptable product shall be 3M's elastomer latex caulk or equivalent.

B. Where caulk cannot be applied then contractor shall use 3M-fire dam spray or equivalent.

2.09 HORIZONTAL WIRE AND CABLE DISTRIBUTION

A. Cables connecting to equipment racks shall be installed with not less than six feet of slack cable between the equipment rack/terminal block and terminal backboard. The slack cable shall be coiled and support on the backboard and/or cable tray.

B. Minimum bending radius of fiber optic cable shall not be less than 9 inches. Maximum pulling tension shall not exceed 100 pounds. In no case shall the manufacturer's recommendations be violated.

C. The minimum bending radius of copper wires cables shall be 10 times the cable outside diameter. The maximum pulling tension and minimum bending radius shall not violate manufacturer's recommendations.

D. Cable lengths over 50 feet shall be machine pulled not hand pulled. Cables shall be pulled in a continuous, smooth operation without jerking or stop-start motion after initiation of pull. Maximum cable pulling speed shall be less than 50 feet per minute. Minimum cable pulling speed shall be greater than 15 feet per minute.

E. No cable shall be run exposed in finished areas. Contractor shall utilize raceways on all exposed interior walls. Raceways shall be both screwed and glued to walls. Raceways corners shall be utilized. Cut Raceways corners shall be neat with no gaps or sharp edges.

F. When laying cable above a ceiling area, the cable shall be suspended above the ceiling and tied for anchorage (48” minimum) with appropriate hangers.

G. Riser cabling (UTP and fiber optics). All riser cable shall carry CMR certification and be installed in conduit.

H. Inter-building and Intra-building Horizontal tie cable. Specific sizing shall be provided in construction documents.

2.10 DATA CLOSET TERMINATIONS

A. Within each MDF/IDF closet, all data wiring and cabling shall be terminated using a 110 punch down block on one side and RJ-45 connectors on the other of the patch panel.

1. Data terminations shall be connected on termination backboards per the 568B telecommunications standards.

1. Contractor shall install Panduit, Ortronics, AMP, Hubble, and Siemens Category 6 or equivalent patch panels on racks with cable management per construction drawings. All cables shall be properly supported and bundled.

2. Data termination shall be patched via appropriate and certified "Category 6" patch cords equipped with required RJ-45 connectors.

3. Cable management products by the same terminating vendor shall be provided. All cable shall be properly tied, trimmed and appear neat.

4. Panduit or equivalent patch panel cables shall be provided for each port. Patch panel cables shall be Category 6 UTP, end to end terminated via RJ45.

5. Provide 18 inches of cable slack at workstation outlets.

6. Supply all necessary B-66 blocks with M-110 standoffs and D-rings to complete the necessary terminations.

PART 3 - EXECUTION

3.01 WORKMANSHIP REQUIREMENTS

A. Category 6 UTP Copper Cable

1. Cables shall be laid at least 2 feet from any fluorescent ballast (in places where this is not possible, the District Representative shall be notified and he/she shall provide the final disposition). Further, cables shall be 'kink' free.

2. Where cables are bundled, they shall be tied at least every 4.0 feet.

3. Cables from each classroom or administrative area shall be pulled and punched down per TIA/EIA 568B standards.

3.02 LABELING - DATA

A. All cables, outlets and terminations shall be labeled and designated in accordance with District standard construction documents and below.

1. Contractor shall label all cable ends with a hand held Panduit or equivalent labeling device. All labels shall be printed by same machine. Hand written labels shall not be accepted. All labels shall be self-adhesive type. Cable shall be labeled within 18 inches of both cable ends. Special clear plastic heat shrink tubing shall be applied to keep labels from falling off. Labels must be clearly visible through heat shrink.

2. Contractor shall label all patch panel port number per District scheme with a Brady or Panduit labeling device. Additionally, a jack chart shall be created displaying the communication room number, panel number, position on the panel and workstation jack number. Chart shall be attached to patch panel(s) with cable/wire and laminated on both sides.

3. All 19 inch rack shall have an engraved plastic plate 12 inches long by 3 inches high on both sides of frame, describing the frame number; i.e., MDF 1, MDF 2 and so on. Label shall be installed at the top of frame with glue and metal screws. Chipped, cracked or otherwise damaged labels shall not be accepted.

4. All conduits either installed or utilized by contractor shall be labeled. Label shall be painted on each conduit with black enamel paint (legibly). If conduit base color is dark, then use white color paint. When there is insufficient writing space on the conduit then use a wire tag that is adhered to conduit. Label only conduit in MDF, IDF(s) and exposed.

5. Labeling Scheme:

1. IDF #: Building Letter (Obtain from District Representative)/Room Number (where IDF is located)

2. Patch Panel #: Label each patch panel port number with room number and port number; Room number/Port number.

3. Workstation #: Label each workstation port with the – Port number of the workstation/patch panel port number/patch panel number/IDF number.

3.03 CLEAN UP

A. Contractor shall replace all tiles damaged in the course of construction.

B. Contractor shall remove smudges, dirt, etc. from all surfaces prior to the final punch list. If walls, floors and other surfaces cannot be cleaned then contractor shall repaint or replace damaged areas/items.

C. Contractor shall replace all damaged carpet in the course of the construction project.

D. Contractor shall clean work areas each day to the same cleanliness found prior to the start of work.

3.04 TESTING AND WARRANTY REQUIREMENTS

A. Guarantees and Warranties

1. Contractor shall guarantee the cabling system, in writing, against defects in workmanship and material for a minimum of 1 year after final acceptance. During this time, the entire system must be kept in proper operating condition at no additional labor or material cost to the Owner. Contactor shall submit a written warrantee when the District approves acceptance.

2. Potential end-user actions, which may void warranty, shall be identified and submitted with bid.

3. If an extended warranty is part of the winning bid, then contractor's work shall be inspected and signed off by the participating termination/Cabling manufacturer's representatives. Contractor shall delineate the conditions, and costs, of this warranty for this period.

3.05 FINAL TESTS AND ADJUSTMENTS (ALL DATA TERMINATIONS AND CABLE PAIRS)

A. All cables shall be tested for continuity and reversal. Any faults, grounds or shorts shall be repaired prior to acceptance of the distribution system. Prior to the acceptance tests, an acceptance test plan shall be provided for approval. Notification shall be provided prior to Contractor starting tests so that site and/or appointed representatives, may witness said tests.

3.06 ACCEPTANCE TESTING OF COMPLETED INSTALLATION – DATA TESTS

A. The contractor performing these tests shall demonstrate familiarity with all details of the system. The test team shall include the field supervisor who was in charge during the course of the installation work.

B. The Contractor shall be responsible for all costs incurred to satisfy criteria requirements utilizing 4-pair test equipment as previously noted.

1. Network Acceptance Testing. The Contractor shall conduct acceptance testing on 100% of the total cable and wire installation unless otherwise notified in writing. Hard copy of all readings and values shall be provided to the District Representative. Additionally:

a) All testing shall follow manufacturer's specifications

b) The testing shall be conducted on all installed cable.

c) Should failures occur, the contractor shall provide evidence of a re-testing of the failed cable and/or terminations.

d) The Owner's Representative and local area network contractor shall be given an opportunity to observe all testing.

2. Minimal Tests: At a minimum, acceptance tests for twisted pair cable shall include the following:

a) All testing shall comply with TIA/EIA 568B standards.

b) All cabling - continuity, open, breaks, shorts, and grounds.

c) Any test not meeting Manufacturer's minimum documented values shall be reported as troubles and shall be repaired or replaced by the Contractor.

d) All Category 6 cables shall be tested in accordance with TIA/EIA 568B. Contractor shall perform tests with a Fluke DTX1200 Cable Analyzer or equivalent Category 6 testing device District approved. The scanner certification shall not exceed one year from the date of starting work. Contractor shall provide the District Representative a copy of the certification date.

e) Contractor shall establish a NVP (Nominal Velocity Propagation) for all copper CATEGORY 6 UTP cable.

f) Contractor shall perform the standard link and channel tests.

g) The cables shall be tested from patch panel to workstation access point. The cable length shall conform to the maximum distances 100 meters.

(1) Wire Map

(2) Length

(3) Attenuation

(4) Pair to pair NEXT loss (Attenuation and near end crosstalk)

(5) DC loop resistance

(6) Impedance

(7) Delay/Skew

(8) ACR (Attenuation to crosstalk ratio)

(9) Power sum calculations for NEXT, ELFEXT and ACR.

(10) Propagation Delay

(11) PSNEXT loss

(12) Pair to pair ELFEXT

(13) Return loss

(14) Pass or Fail

3. Cable certifications tests shall be printed and bounded in a 3 ring binder. A copy of all testing shall be provided to the Director of IT, RSD. Test reports shall clearly identify the building and room/office/area number of the cable being tested. One copy shall be delivered to the architect.

4. Contractor shall obtain full Category 6 certification for Gigabit 1000 BASE-T on all installed "Local Area Network" UTP cable.

C. Minimal tests for fiber-optic cabling shall include:

1. Contractor shall utilize both an Optical Time Domain Refractometer (OTDR) and a power loss tester. Some OTDR's have both capabilities built-in and this is acceptable. Contractor shall submit a written and signed report, that all terminated fiber optic cables are within manufacturer's specifications. The OTDR shall have been certified within the past 12 months prior to start of the work. A copy of the certification shall be presented to the District Representative prior to the start of testing. Multimode fiber testing shall meet the requirements of ANSI/TIA/EIAA-526-14-A. Singlemode fiber testing shall meet the requirements of ANSI/TIA/EIAA-526-7.

2. The standard eight basic fiber-optic cable tests shall be performed in addition to any others the contractor generally provides:

a) Distance Test

b) Fiber-loss Test

c) Event Loss Test

d) Link Loss Test

e) Return Loss Test

f) Link-Return Loss Test

g) End to End Loss Test

h) OTDR graph

3. All terminated fiber strands shall be tested and written results provided to the District Representative.

4. Any fiber-optic pairs not meeting manufacturer specifications shall be repaired or replaced by the Contractor at no further cost to the District.

5. Test Standards

	Multi mode 850nm/1300nm 50/125 micron	Single-mode 1310nm/1550nm 8.3 micron
Max. Attenuation (dB/km)	3.5/1.0	.37/. 25
Typical Attenuation (dB/km)	3.2/0.9	--
Minimum Bandwidth (MHz km)	160/500	dispersion <3.2/1.8

D. REPORTS

1. Upon completion of above tests for all installed cabling and wiring, Contractor shall submit a written report presenting test results, including numerical values, where applicable, for all measurements for review prior to demonstration and final "acceptance testing".

2. With the above report, submit written certification that the installation conforms to specifications, is complete, and is ready for inspection and testing.

END OF SECTION

SECTION 283100

FIRE ALARM SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Addenda, Alternates, Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specifications collectively apply to work of this Section.

1.2 WORK INCLUDED

A. Section Includes:

1. The work under this section includes all labor, material, equipment, supplies, labor, testing, and accessories required to demolish the existing system and furnish and install a complete new automatic Emergency Voice/Alarm Communications type Fire Alarm System as indicated on the drawings and as specified herein. Remove existing initiating & signaling circuits to new panel. Program new panel to include reconnected devices.
2. It is the intent of the Drawings and Specifications for the Contractor to provide and install a complete, fully operational, and tested system.
3. All miscellaneous system components including, but not limited to control panels, digital communicator, alarm detection devices, alarm initiation devices, alarm indicating devices, voice/amplifier panels, remote power supplies, terminal cabinets, terminal blocks, conduits, wires, programming, testing, etc, as well as any other related items, shall be furnished and installed complete under this section, such that the system shall perform all functions listed herein in compliance with all of the specified requirements.
4. The complete installation shall conform to the following codes:

2022 Building Standards Administrative Code
2022 California Building Code (CBC)
2022 California Electrical Code (CEC)
2022 California Fire Code (CFC)
2016 NFPA-72
Underwriters Laboratories Inc.

All equipment shall be approved by Underwriters Laboratories, Inc. for its intended purpose, listed as power limited by Underwriters Laboratories, Inc., for the following standards as applicable:

UL 864 UOJZ Control units for Fire Protective Signaling Systems

	Local Signaling Unit Central Station Signaling Protected Premises Unit Remote Signaling Protected Premises Unit. Water Deluge Releasing Unit
UL 268	Smoke Detectors for Fire Protective Signaling systems.
UL 521	Heat Detectors for Fire Protective Signaling systems.
UL 464	Audible Signaling appliances
UL 1638	Visual Signaling appliances
UL 38	Manually Activated Signaling Boxes
UL 1481	Power Supplies for Fire Protective Signaling systems.
UL 2572	Control and Communication Units for Mass Notification Systems

B. Related Sections:

1. Section 26 0100: Basic Materials and Methods.
2. Section 26 0533: Conduit
3. Section 26 0519: Wire and Cable
4. Section 26 0534: Boxes

1.3 SYSTEM REQUIREMENTS

A. Fire detection system shall continually supervise and monitor the following initiating, signaling, and monitoring circuits:

1. Manual fire-pull stations.
2. Smoke and heat detectors, monitor modules, relay modules, etc.
3. Alarm signaling circuits including alarm, horns and visual alarm units.
4. Annunciators.
5. Power supplies and batteries.
6. Interconnection with HVAC system.

B. System controls shall be UL listed for power limited applications in accordance with California Electrical Code.

C. The fire alarm devices and equipment shall be listed for installation for the fire alarm control panel to which they are being connected.

D. System labels and devices programming addresses shall be based on actual signage and building labeling as currently exist.

1.4 CERTIFICATION

A. Certification: Installation of fire alarm system shall not begin until Shop Drawings, including State Fire Marshal listing numbers of fire alarm components, are submitted and reviewed by the Architect. Written certification by fire alarm

equipment distributor or manufacturer shall be submitted to the Architect stating that system and its component parts are as approved and listed by the State Fire Marshal, and that the design conforms to requirements set forth in CBC.

1.5 PERFORMANCE

A. System shall be fully programmable, configurable, and expandable in the field without special tools or PROM programmers and shall not require replacement of memory ICs. Installer shall provide a CD of all system installed software, site specific system programming and all information and tools required to re-program or modify the system.

1.6 SYSTEM FUNCTIONAL OPERATION

A. Alarms:

1. When a device indicates any alarm condition, the control panel must respond within 10 seconds. The general Alarm or Supervisory alarm LED on the annunciator(s) should light and the LCD should prompt the user as to the number of current events. The alarm information must be stored in event memory for later review. Event memory must be available at the main and all remote annunciators.
2. When the alarmed device is restored to normal, the control panel shall be required to be manually reset to clear the alarm condition, except that the alarms may be silenced as programmed.
3. An alarm shall be silenced by a code or firefighter key at the main or remote annunciators. When silenced, this shall not prevent the resounding of subsequent events if another event should occur (subsequent alarm feature). When alarms are silenced the Silenced LED on the control panel, and on any remote annunciators, shall remain lit until the alarmed device is returned to normal.

B. Troubles

1. When a device indicates a trouble condition, the control panel Trouble LED on the annunciator(s) should light and the LCD should prompt the user as to the number of current events. The trouble information must be stored in event memory for later review. Event memory must be available at the main and all remote annunciators.
2. When the device in trouble is restored to normal, the control panel shall be automatically reset. The trouble restore information must be stored in event memory for later review. Event memory must be available at the main and all remote annunciators. A trouble shall be silenced by a code or firefighter key at the main or remote annunciators. When silenced, this shall not prevent the resounding of subsequent events if another event should occur.

C. Supervision Methods

1. Each SLC loop shall be electrically supervised for opens and ground faults in the circuit wiring, and shall be so arranged that a fault condition on any loop will not cause an alarm to sound.
2. Additionally, every addressable device connected to the SLC will be supervised and individually identified if in a fault condition. The occurrence of any fault will light a Trouble LED and sound the system trouble sounder, but will not interfere with the proper operation of any circuit which does not have a fault condition.
3. Each indicating appliance circuit shall be electrically supervised for opens, grounds and short circuit faults, on the circuit wiring, and shall be so arranged that a fault condition on any indicating appliance circuit or group of circuits will not cause an alarm to sound. The occurrence of any fault will light the trouble LED and sound the system trouble sounder, but will not interfere with the proper operation of any circuit which does not have a fault condition.

1.7 POWER REQUIREMENTS

A. The fire alarm control panel, voice control panels and remote power supply shall receive 120 VAC power, 60 Hz, through a dedicated 20 amps circuit. Circuit breaker protection for the dedicated fire alarm power circuits shall be equipped with a handle lock-on device, the breaker handle shall be colored red and labeled "FIRE ALARM". Clearly label the Electrical panel name, location and circuit number on the inside of the fire alarm control panel and all remote power supplies using a p-touch style labeling system. Transient voltage surge suppression shall be provided at the 120VAC input terminal.

B. Circuits requiring system operating power shall be 24 VDC and shall be individually protected at control panel.

1.8 SYSTEM DESIGN PARAMETERS

A. Standby power

1. The standby power supply shall be an electrical battery with capacity to operate the system under maximum supervisory load for twenty four (24) hours and capable of operating the system for five (15) minutes of evacuation alarm on all devices, operating at maximum load. The system shall include a charging circuit to automatically maintain the electrical charge of the battery. The system shall automatically adjust the charging of the battery to compensate for temperature.

B. Voltage Drop

1. Under all operating conditions, the voltage on the NAC must be sufficient to operate all the notification appliances so that they deliver the proper signal intensity. The worst case operating condition shall be calculated from when the control units' primary powers supply has failed and the battery capacity is at its lowest point. An end of useful battery life starting value of 20.4 Volts shall be used at the starting voltage unless the manufacturer's instructions indicate that a higher or lower value should be used. The current draw of an appliance at the minimum listed operating voltage (16 Volts) should be used.
2. The point-to-point Ohm's Law voltage drop calculations of all alarm system circuits shall not exceed

C. Spare Capacity

1. The system shall be engineered to accommodate 20% spare capacity on each individual loop, and 20% spare on system power supplies.

D. Circuiting Guidelines

1. Initiating Device Circuits

a. Where necessary, conventional initiating device circuits (i.e. waterflow switches, valve supervisory switches, fire pump functions, etc.) shall be Class B (Style "A" or "B").

2. Notification Appliance Circuits

a. All notification appliance circuits shall be Class B (Style "Y"). The notification circuits shall be power limited. Non-power limited circuits are not acceptable.

3. Signaling Line Circuits: Addressable Analog Devices

a. The signaling line circuit connecting to addressable/analog devices including, detectors, monitor modules, control modules, isolation modules, intrusion detection modules and notification circuit modules shall be Class B (style 4).
b. Each addressable analog loop shall be circuited so device loading is not to exceed 80% of loop capacity in order to leave for space for future devices.

4. Signaling Line Circuits: Data & Audio for FACP & Annunciator Network

a. The signaling line circuit connecting network panel/nodes, annunciators, command centers, shall be Class A (style 7). The

media shall be copper except where fiber optic cable is specified on the drawings.

1.09 SUBMITTALS

A. Component Plan Submittal: Availability and listing for its application shall be verified for all system components before presentation of the submittal. Include the following information and details as applicable:

1. Installer name, address, telephone number.
2. List of system components, equipment and devices, including manufacturer model numbers, quantity and California State Fire Marshal listing numbers, mounting heights, and symbols.
3. Current copies of manufacturer specification sheets for equipment and devices indicated. Highlight or identify the specific components on Catalog cut sheets.
4. Voltage Drop Calculations: Include the following information for the worst case:

    a. Point-to-point or Ohms law calculations.
    b. Zone used in calculations.
    c. Voltage drop percent. Voltage drop shall not exceed manufacturer's requirements. If voltage drop exceeds 10 percent, indicate manufacturer listed operating voltage ranges for equipment and devices.
    d. Speakers and amplifier calculations.

5. Battery types, amp hours, and load calculations including the following:

    a. Normal operation: 100 percent of applicable devices for 24 hours to equal control panel amps plus list of amps per device that draw power form the panel during standby power condition including, but not limited to, zone modules, detectors and devices as identified.
    b. Alarm condition: 100 percent of voice communication speakers for 15 minutes and 100 percent of horns and bells for 5 minutes to equal control panel amps plus list of amps per device that draw power from panel during alarm condition including, but not limited to, the following:

        (1) Zone modules.
        (2) Signal modules.
        (3) Detectors.
        (4) Signal devices.
        (5) Annunciator.
        (6) Other devices as identified.

c. Normal operation plus alarm operation load calculation shall include total amp hours required and total amp hours provided.

6. Provide one copy of testing procedures.

B. Shop Drawings: Provide Shop Drawings, in the same size as the design Drawings, Shop Drawings shall include the following:

1. Provide drawing scale, elevations of all system enclosures, and actual layout of the Fire Alarm Control Panel, power supply, annunciator, and all main system components.
2. Site Plan indicating equipment to be monitored or supervised; such as water flow valves, and main equipment such as control panels, power supplies, annunciators, and components such as outdoor wall-mounted horns, sprinkler bells, pull boxes, underground pull boxes, wiring routes on buildings exterior and underground locations. In each conduit or raceway run indicate conduit sizes, and quantities and type of wires.
3. Complete battery calculations, and voltage drop calculation shall be included; these calculations shall be based on the devices maximum UL current rating.
4. One line drawing for the entire system network indicating all system components and wiring. The one line diagram shall show but not be limited to panel to panel interconnections, conductors gauge and quantity, conduit size and type (designation) and specific function.
5. System panel one-line drawings indicating the quantity and type (designation) of conductors entering and exiting the fire alarm terminal cabinet in each building (enclosure) for initiating, notification, or other command control functions required for complete system operation:

    a. Individual floor/building plan view drawings indicating all device locations including end of line resistors “EOLR” in accordance with the legend provided.
    b. Individual point addresses for all initiation and notification devices.
    c. Device “typical” wiring diagrams. These drawings shall indicate specific termination details for all peripheral equipment and/or interface devices.

6. Provide interfacing with equipment furnished by others including voltages, and other required coordination items.

7. Each of the pictorial diagrams included shall appear identical to the products they are intended to depict, in order to speed installation of the system, and to enhance the accuracy of the installation Work. Typical wiring diagrams or catalog sheets are not permitted.
8. Background Drawings with device locations of DSA approved drawings are available in electronic format and may be obtained from the Architect.

Contractor is solely responsible for the accuracy and completeness of shop drawings. Buildings that are not part of the contract shall be clearly identified "NOT IN CONTRACT". Shop Drawings shall be prepared in the latest version of AutoCAD.

9. Other installation and coordination drawings specifically related to this section shall be included as follows:

    a. Size A (8-1/2 inch x 11 inches) and size B (11 inch x 17 inch) shall be bound into the manual.
    b. Larger drawings shall be folded and inserted into transparent envelopes and bound into the manual.

10. Installation and coordination drawings for items in other sections shall be included with submittal of Shop Drawings. Submit blue line copies and one reproducible copy of installation and coordination drawings.

C. In addition to the above requirements, provide submittals to meet any additional requirements of DSA.

1.10 QUALITY ASSURANCE

A. Installer shall have successfully completed at least 5 projects of equal scope in the past 5 years, and have been in business of furnishing and installing fire alarm systems of this type for at least 5 years. Installer shall use apprentices with certified Life Safety Blue Card Holders.

B. Installer shall be a factory authorized distributor and service provider for the brand of equipment offered and shall provide documentation to the Architect upon request.

C. Installer shall maintain a fully equipped service organization capable of furnishing repair service to the equipment and shall maintain a spare set of major parts for the system at all times.

D. Installer shall furnish a letter from manufacturer of equipment certifying equipment has been installed according to factory standards and that system is operating properly.

E. Certifications: Installer shall submit certification from the equipment manufacturer indicating that installer is an authorized representative of the equipment manufacturer and is trained on network applications.

F. All materials and equipment installed shall be new except as specifically shown on the drawings.

G. All of the fire alarm equipment, devices and wiring in this specification including control panel, remote power supplies, detectors, modules, speakers, strobes, fire alarm wires, etc., shall be furnished and installed by the Authorized Factory Distributor of the equipment. Furnish a letter from the manufacturer of all major equipment, which certifies that the installer is an authorized distributor and that the equipment has been installed according to factory intended practices. Furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment. All rough-ins including conduits, boxes, 120-volt power wiring may be installed by an electrician.

H. Contractor/Installer's electricians and fire/life safety technicians shall be certified in accordance with Labor Code sections 3099, and 3099.2, and section 209.0 of the California Code of Regulations.

I. System startup and testing shall be performed under the direct observation of the IOR and OAR. The Contractor at this time shall provide a legible half size reproduction of the original completed fire alarm red-line drawings (this copy will be retained by the Owner), an accurate copy of the fire alarm system points list, and a copy of the construction drawings on CD in AutoCAD format,

J. Provide and install the most current software package available at the time of installation. At the time of Owner Acceptance of the installation, all equipment, including any and all updated software which is to include the appropriate operating system, pass-codes, electronic keys and program disks, manuals and cables employed in the installation of the system, shall be delivered to the OAR who will, in turn, forward the items to the District. In addition, when the programming software is available in disk format, a backup copy of the most up to date revision, in disk format, shall be delivered to the OAR at the completion of the project. A software license agreement shall be made available for the responsible Owner representative to sign at the time of training.

1.11 WARRANTY

A. The Fire Alarm Equipment Manufacturer shall provide a 3-year material warranty. Installer shall provide a 3-year labor warranty.

B. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer for a period of 5 years after expiration of the warranty.

1.12 MAINTENANCE PERIOD

A. Maintenance Service: Provide, as part of the Work of this section, a 12 month maintenance service period commencing from the date of Substantial Completion.

B. Maintenance and testing shall be as required by local authorities having jurisdiction. A preventive maintenance schedule shall be provided, describing the plan for preventive maintenance of devices and subassemblies requiring regular maintenance. The schedule shall include:

1. Systematic examination, adjustment and cleaning of detectors, manual fire alarm stations, control panels, power supplies, relays, water flow switches and accessories of the fire alarm system.
2. Circuits in the fire alarm network shall be tested semiannually.
3. System shall be tested in accordance with the requirements of NFPA 72.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. All existing panels and peripheral devices shall be of the standard product of single manufacturer and shall display the manufacturer's name of each component. The catalog numbers specified under this section are those of Silent Knight 6820EVS and shall constitute the type, product quality, material and desired operating features.

2.2 GENERAL

A. All equipment and components shall be the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approval agency for use as part of a protected premises (fire alarm) system.

B. The contractor shall provide, from the acceptable manufacturer's current product lines, equipment and components, which comply, with the requirements of these specifications. Equipment or components, which do not provide the performance and features, required by these specifications are not acceptable, regardless of manufacturer.

C. All System components shall be the cataloged products of a single supplier. All products shall be UL listed by the manufacturer for their intended purpose.

D. All control panel assemblies and connected field appliances shall be both designed and manufactured by the same company, and shall be tested and cross-listed as to ensure that a fully functioning system is designed and installed.

2.3 FIRE ALARM CONTROL PANEL (FACP)

A. Control Panel with Emergency Voice System

1. The existing fire alarm control panels (FACP) are Silent Knight 6820 EVS analog addressable control panel. The existing audio amplifiers are Silent Knight EVS-50W as required voice evacuation units. The FACP shall have a 9 amp power supply and be capable of expansion via bus connected expander modules that supervise low battery, loss off AC and loss of communication.
2. The system must contain at least one Silent Knight EVS-50W watt amplifier and shall be expandable up to 2000 watts utilizing 16 additional amplifiers. Each amplifier shall be capable of adding a 4-zone splitter (Silent Knight EVS-CE4) to distribute the audio information to different locations in the installation. The amplifiers must contain the capability of being remotely located through a four-wire SBUS communications circuit and a two-wire VBUS circuit.
3. The voice evacuation system must have the capability of downloading 15 to 60 second messages and utilize DSP technology for higher audio intelligibility.
4. The voice evacuation system shall be capable of operating at 25vrms or 70.7vrms, must be field selectable at the amplifier level. Systems that require additional modules for voltage conversion shall not be accepted.
5. The existing main panel shall contain one SLC circuit and three 5815XL expander modules. Each SLC circuit shall support up to 159 detectors and 159 modules. The communication protocol on the SLC loop must be digital.
6. The existing FACP shall support programmable Flexput circuits. The panel shall have a built in LCD annunciator with the capability of having additional supervised remote annunciators connected in the field.
7. The existing FACP must have a built-in UL approved digital communicator. The communicator must allow local and remote up/downloading of system operating options, event history, and detector sensitivity data.
8. The existing FACP must automatically test the smoke detectors in compliance with NFPA standards to ensure that they are within listed sensitivity parameters and be listed with Underwriters Laboratories for this purpose.
9. The existing FACP must compensate for the accumulation of contaminants that affect detector sensitivity. The existing FACP must have day/night sensitivity adjustments, maintenance alert feature (differentiated from trouble condition), detector sensitivity selection, auto-programming mode (Jumpstart) and the ability to upgrade the core operating software on site or over the telephone.
10. The existing FACP must have maintenance alert feature (differentiated from trouble condition) and a calibration trouble condition.
11. The existing FACP shall have a Jumpstart feature that can automatically enroll all properly connected accessories into a functional system within

60 seconds of powering up the panel. Panels that do not have these capabilities will not be accepted.

12. The existing main communication bus (SBUS RS485) shall be capable of class A or class B configuration with a total bus length of 6,000 feet.

2.4 System Wiring

A. The Signaling Line Circuit (SLC) and data communication bus (SBUS) shall be wired with standard NEC 760 compliant wiring. No twisted, shielded or mid-capacitance wiring is required for standard installations. All FACP screw terminals shall be capable of accepting 14-18 AWG wire. All system wiring shall be in accordance with the requirements of NFPA 70, the National Electrical Code (NEC) and also comply with article 760 of the NEC.

2.5 Signaling Line Circuits

A. Each SLC shall be capable of a wiring distance of 10,000 feet from the SLC driver module (5815XL) and be capable of supporting 159 detectors and 159 addressable module devices. The communication protocol to SLC devices must be digital. Any SLC loop device which goes into alarm must interrupt the polling cycle for priority response from the FACP. The FACP must respond consistently to a device that goes into alarm on an SLC within 10 seconds. The auxiliary 5815XL SLC loop module must be capable of being located up to 6000 feet from the FACP on the SBUS, which is separate from the SLC circuit. The SLC shall be capable of functioning in a Class A or Class B configuration.

2.6 SLC Loop Devices

A. Devices supported must include addressable photoelectric and ionization smoke detectors, addressable heat detectors, addressable input modules, relay output modules or addressable notification modules. There is to be no limit to the number of any particular device type up to the maximum of 99 detectors and 99 addressable modules that can be connected to the SLC.

2.7 Addressable Detector Functions

A. The products of combustion detectors must communicate analog values using a digital protocol to the control panel for the following functions:

1. Automatic compliance with NFPA 72 standards for detector sensitivity testing
2. Drift compensation to assure detector is operating correctly
3. Maintenance alert when a detector nears the trouble condition
4. Trouble alert when a detector is out of tolerance
5. Alert control panel of analog values that indicate fire.

2.8 Programmable Flexputs

A. The existing FACP shall support programmable Flexput circuits that are capable of being programmed as supervised reverse polarity notification circuits or supervised auxiliary power circuits that can be programmed as continuous, resettable or door holder power. The circuits shall also be programmable as input circuits in Class A or Class B configurations to support dry contact or compatible two wire smoke detectors.

2.9 Addressable Notification Module

A. The contractor shall furnish and install where indicated on the plans, addressable notification modules. The modules shall be U.L. listed compatible with existing Silent Knight 6820 EVS fire alarm control panel. The notification module must provide one Class A or Class B notification output with one auxiliary power input. The notification module must be suitable for mounting in a standard 4 inch square electrical box and must include a plastic cover plate. The notification module must provide an LED that is visible from the outside of the cover plate. The notification module must be fully programmable for such applications as required by the installation. The SK-Control shall reside on the SLC loop and can be placed up to 10,000 feet from the control or 5815XL SLC loop module.

2.10 Annunciators

A. The existing main control has a built-in annunciator with LCD display and feature LED's for General Alarm, Supervisory, System Trouble, System Silence and Power. When in the normal condition the LCD shall display time and date based on a 200-year clock which is capable of automatic daylight savings time adjustments. All controls and programming keys are silicone mechanical type with tactile and audible feedback. Keys have a travel of .040 inches. No membrane style buttons will be permissible. The annunciator must be able to silence and reset alarms through the use of a keypad entered code or by using a firefighter's key. The annunciators must have twenty levels of user codes that will allow the limitation of operating system programming to authorized individuals.

2.11 Remote Annunciators

A. Existing EVS-LOC Remote Command Unit with display and microphone. LCD remote annunciators shall have the same control and display layout so that they match identically the built-in annunciator. LED remote annunciators shall have individually mapped LED's and reset and silence inputs. The reset and silence inputs must use the same firefighter's key as the LCD annunciators. Remote annunciators shall be capable of operating at a distance of 6000 feet from the main control panel on unshielded, non-twisted cable.

2.12 I/O Module

A. The existing fire system shall be able to support I/O modules, which shall be used to drive remote LED graphic style displays and accommodate. The I/O module inputs shall be supervised and be suitable for alarm and trouble circuits as well as reset and silence switches.

2.13 Serial/Parallel Interface

A. The fire system shall be capable of supporting up to two (2) serial / parallel interface modules that are capable of driving standard computer style printers. The interface shall be programmable as to what information is sent to it and shall include the ability to print out detector status by point, event history by point and system programming. Provide (1) interface module.

2.14 Distributed Power Modules

A. The existing power modules model 5496 compatible with the fire alarm control panel has 6 amps of output power with four (4) notification circuits rated at 3 amps each. The four notification circuits shall operate as reverse polarity notification outputs or auxiliary power outputs for constant, resettable, or door holder applications. The module shall be capable of being connected via the SBUS at a maximum distance of 6000 feet from the main control panel.

B. The power module's SBUS bus shall be electrically isolated providing ground loop isolation and transient protection.

2.15 Digital Communicator

A. The existing digital communicator must be an integral part of the control panel and be capable of reporting all zones or points of alarm, supervisory, and trouble as well as all system status information such as loss of AC, low battery, ground fault, loss of supervision to any remote devices with individual and distinct messages to a central station or remote station. The communicator must also be capable of up/downloading of all system programming options, event history and sensitivity compliance information to a PC on site or at a remote location.

B. The existing communicator shall have an answering machine bypass feature that will allow the panel to respond to communication even on phone lines that have other communication equipment present. The communicator must be capable of reporting via SIA and Contact ID formats. The communicator shall have a delayed AC loss report function which will provide a programmable report delay plus a 10-25 min random component to help ease traffic to the central station during a power outage. No controls that use external modems for remote programming and diagnostics shall be accepted.

2.16 Dry Contacts

A. The existing FACP will have form “C” dry contacts, one will be dedicated to trouble conditions, the other two will be programmable for alarm, trouble, sprinkler supervisory, notification, pre-alarm, waterflow, manual pull, zone aux. 1 or zone aux. 2. The trouble contact shall be normal in an electrically energized state so that any total power loss (AC and backup) will cause a trouble condition. In the event that the microprocessor on the FACP fails, the trouble contacts shall also indicate a trouble condition.

2.17 Ground Fault Detection

A. There is a ground fault detection circuit to detect positive and negative grounds on all field wiring. The ground fault detection shall operate the general trouble devices as specified but shall not cause an alarm to be sounded. Ground fault will not interfere with the normal operation, such as alarm, or other trouble conditions.

2.18 Overcurrent Protection

A. All low voltage circuits will be protected by microprocessor controlled power limiting or self restoring poly switches for the following: smoke detector power, main power supply, indicating appliance circuits, battery standby power and auxiliary output.

2.19 Test Functions

A. A Lamp Test mode shall be a standard feature of the fire alarm control panel and shall test all LED’s and the LCD display on the main panel and remote annunciators.

B. A Walk Test mode shall be a standard feature of the fire alarm control panel. The walk test feature shall function so that each alarm input tested will operate the associated notification appliances for six seconds. The FACP will then automatically perform a reset operation and confirm normal device operation. The event memory shall contain the information on the point tested.

C. A Fire Drill mode shall allow the manual testing of the fire alarm system notification circuits. The Fire Drill shall be capable of being controlled at the main annunciator, remote annunciators and a remote contact input.

D. A bypass mode shall allow for any point or NAC circuit to be bypassed without effecting the operation of the total fire alarm system.

2.20 Remote Input Capabilities

A. The existing control panel shall have provisions for supervised switch inputs for the purpose of alarm reset and alarm and trouble restore.

2.21 Notification Appliance Mapping Structure

A. All notification circuits and modules shall be programmable via a mapping structure that allows for a maximum of 250 output groups. Each of these groups shall have the ability to be triggered by any of the panel's 125 zones. A zone may trigger groups individually or may contain a global trigger for manual pull stations, fire drills and two different system alarms. Additionally, each zone will individually control the cadence pattern of each of the groups that it is "mapped" to so that sounders can indicate a variety of conditions. The zone shall be capable of issuing a different cadence pattern for each of the groups under its control. The mapping structure must also allow a group to be designated to "ignore cadence" for use with strobes and other continuous input devices. Zones shall have eight different output categories; Detector Alarm, Trouble, Supervisory, Pre-Alarm, Waterflow, Manual pull, Zone Auxiliary 1 and Zone Auxiliary 2. Each of the categories shall have the ability to control from 1 to 8 output groups with a cadence pattern. The patterns are; March Code, ANSI S-3.41, Single Stroke Bell Temporal, California Code, Zone 1 Coded, Zone 2 Coded, Zone 3 Coded, Zone 4 Coded, Zone 5 Coded, Zone 6 Coded, Zone 7 Coded, Zone 8 Coded, Custom Output Pattern 1, Custom Output Pattern 2, Custom Output Pattern 3, Custom Output Pattern 4, Constant, ANSI 4 Temporal, Amseco Synchronization, Faraday Synchronization, Gentex Synchronization, System Sensor Synchronization and Wheelock Synchronization. This mapping/cadence pattern shall be supported by all system power supplies and notification expander modules.

2.22 On-Board Programmer

A. The existing FACP shall have an on board programmer which will allow for all system functions and options to be programmed via the on board annunciator keypad. Any panel that does not have this capability will not be accepted.

2.23 Downloading Software

A. The existing fire alarm control panel must support up/downloading of system programming from a PC under Windows XP, Windows Vista, or Windows 7. The FACP must also be able to download the detector sensitivity test results and a 1000 event system event buffer to the PC. Communication shall take place over a direct connection to the PC and/or via the same telephone lines as the built in digital communicator and shall not require an external modem to be connected to the panel. The downloading software shall contain a code that will block unauthorized persons from accessing the panel via direct connection or over the phone lines.

2.24 Facility Management Software

A. The existing FACP must support facility management software capable of providing off site access to FACP data that is necessary to manage fire system operation. A software package capable of uploading the detector sensitivity test results and the 1000 event system event buffer to the PC shall be required as part of the bid package. Communication shall take place over a direct connection to the PC and/or via the same telephone lines as the built in digital communicator. The facility management package must be separate from the downloading package and must not be capable of affecting programmed system options.

2.25 English Language Descriptions

A. The existing FACP shall provide the ability to have a text description of each system device, input zone and output group on the system. The use of individual lights to provide descriptions will not be acceptable.

2.26 CONTROL UNIT

A. Audible System Trouble Sounder

1. An audible system trouble sounder shall be an integral part of the control unit. Provisions shall also be provided for an optional supervised remote trouble signal.

C. Power Supply and Charger:

1. The entire system shall operate on 24 VDC, filtered switch mode power supply with the rated current available of 9 Amps. The FACP must have a battery charging circuit capable of complying with the following requirements:
   Twenty-four (24) hours of battery standby with five (15) minutes of alarm signaling at the end of this twenty-four (24) hour period (as required per NFPA 72 central station signaling requirements) using rechargeable batteries with automatic charger to maintain gel-cell batteries in a fully charged condition.
2. The power supply shall comply with U.L. Standard 864 for power limiting.
3. The existing FACP will indicate a trouble condition if there is a loss of AC power or if the batteries are missing or of insufficient capacity to support proper system operation in the event of AC failure. A battery test will be performed automatically every minute to check the integrity of the batteries. The test must disconnect the batteries from the charging circuit and place a load on the battery to verify the battery condition.
4. In the event that it is necessary to provide additional power one or more of the model distributed power modules shall be used to accomplish this purpose.

D. Connections and Circuits

1. Connections to the light and power service shall be on a dedicated branch circuit in accordance with the National Fire Alarm Code NFPA 72, National Electrical Code (NEC) NFPA 70, and the local authority having jurisdiction (AHJ). The circuit and connections shall be mechanically protected. A circuit disconnecting means shall be accessible only to authorized personnel and shall be clearly marked "FIRE ALARM CIRCUIT CONTROL".

E. The existing FACP shall support the operation of 159 detectors and 159 addressable module total devices per SLC loop without regard to device type.

2.27 Devices:

Furnish and install, where shown on the drawings, the following devices:

A. Notification Devices

1. The visual and audio/visual signaling devices shall be compatible with the control panel and be listed with Underwriters Laboratories Inc. per UL 1971 and/or 1638. Each indicating appliance circuit shall be electrically supervised for opens, grounds and short circuit faults on the circuit wiring and shall be so arranged that a fault condition on any indicating appliance circuit or group of circuits will not cause an alarm to sound. The occurrence of any fault will light the trouble LED and sound the system trouble sounder, but will not interfere with the proper operation of any circuit which does not have a fault condition. Refer to drawing for specific types.

B. Smoke Detectors

1. Smoke detectors shall be Silent Knight Photo ceiling mounted, addressable photoelectric smoke detectors. The combination detector head and twist lock base shall be U.L. listed compatible with the fire alarm control panel. The base shall be the appropriate twist lock base. The smoke detector shall have a flashing status LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady at full brilliance. The detector may be reset by actuating the control panel's reset switch. The sensitivity of the detector shall be capable of being selected and measured by the control panel without the need for external test equipment. The vandal security-locking feature shall be used in those areas as indicated on the drawing. The locking feature shall be field selectable when required. It shall be possible to perform a sensitivity test of the detector without the need of generating smoke. The test method shall simulate the effects of products of combustion in the chamber to

ensure testing of the detector circuits. Detectors shall have completely closed back to restrict entry of dust and air turbulence and have a 30 mesh insect screen. Electronics of the unit shall be shielded to protect against false alarms from E.M.I. and R.F.I.

C. Heat Detectors

1. Furnish and install analog/addressable heat detectors, Silent Knight. The combination heat detector and twist lock base shall be U.L. listed compatible with the Silent Knight fire alarm control panel. The base shall permit direct interchange with the Ion smoke detector, Acclimate smoke detector and the Photo photoelectric smoke detector. The base shall be appropriate twist lock base. The heat detector shall have a flashing status LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady at full brilliance. The detector may be reset by actuating the control panel's reset switch. The vandal security-locking feature shall be used in those areas as indicated on the drawings. Electronics of the unit shall be shielded to protect against false alarms from E.M.I. and R.F.I.

D. Refer to drawings for speakers, strobes and speaker/strobe units.

PART 3 - EXECUTION

3.1 SYSTEM INSTALLATION

A. Install required conductors to devices indicated on Drawings. Provide required conductor terminations to devices for a complete system to function as specified and indicated on Drawings. Refer to Section 26 0519: Low-Voltage Wire 600 Volt AC, for wire type and wire color for device types.

B. Splices shall not be provided in junction boxes. Terminations shall be in terminal cabinets or on equipment terminals.

C. Conductors shall be installed within conduits, boxes, and terminal cabinets in a totally enclosed installation. Furnish and install conductors required to connect incoming and outgoing circuits, including spare conductors, to terminal strips within terminal cabinets.

D. Wiring within equipment and terminal cabinets shall be installed to conform to standard engineering practice, and shall be terminated on terminal blocks having terminals for required connections. Wiring shall be cabled, laced, and securely fastened in place so that no weight is imposed on equipment or terminals.

E. Install required terminal blocks within terminal cabinets. Terminal blocks shall be installed on inside back of cabinets only, not on side. Incoming wiring shall be

terminated on the left side of terminal blocks, outgoing wiring shall be terminated on the right side of the terminal blocks.

F. Conductors shall be color-coded and tagged with code markers at terminal cabinets, junction boxes, pull boxes and equipment. A wire index shall be typed and installed on terminal cabinet doors. Index shall be covered with clear plastic adhesive covers. Wiring shall be identified as to building and location of devices in the index.

G. Wiring within equipment and terminal cabinets shall be carefully strapped, and shall be formed in rectangular configuration. Wires shall be properly numbered in numerical order and shall maintain same number throughout the Project site.

H. Complete installation shall comply with local building codes and applicable provisions of the California Electrical Code.

I. Location of outlet boxes and equipment on Drawings is approximate, unless dimensions are indicated. Do not scale Drawings to determine locations and routing of conduits and outlet boxes. Location of outlet boxes and equipment shall conform to architectural features of the building and other Work already in place, and must be ascertained in the field before the start of Work.

J. Drawings generally indicate Work to be provided, but do not indicate all bends, transitions or special fittings required to clear beams, girders or other Work already in place. Investigate conditions where conduits are to be installed, and furnish and install required fittings.

K. Provide a laminated engraved bakelite, or etched metal tag, black lettering on white background, approximately ½" wide x 1" long for each indicating device that is hidden from view, and notification devices that contain an end of line resistor. Tags shall include an abbreviation for the type of device: HD for heat detector, EOL for end of line resistor, DSD for duct smoke detector. Tags shall be permanently attached on access panel or t-bar grid which is used to access a hidden device. Tags for notification devices containing end of line resistors shall be attached to the device or adjacent surface.

L. Smoke, heat, modules, NAC circuits shall be clearly labeled with clear black round and black lettering to indicate loop and address. Heat detectors shall be labeled in drop ceiling within 4 feet of devices.

M. NAC circuits shall be labeled like a device with its own address.

N. Color code wires: blue/yellow for notification circuit. Red/black for auxiliary power.

O. For surface mount applications, use special finished red electrical boxes compatible with the fire alarm devices and available from the device manufacturer. Do not just use standard electrical boxes with knockouts.

3.2 TESTING

A. A 24 hour notice shall be provided to the IOR before final testing.

B. Testing of fire detection system shall be as required by the State Fire Marshal and local authorities having jurisdiction. Installer is responsible for identifying required testing, coordinating, scheduling, and conducting tests before Substantial Completion. Tests shall include the following:

1. Operation of signal-initiating devices (smoke and heat detectors).
2. Operation of indicating devices (alarm speakers).
3. Operation of system features under normal operation.
4. Operation of system supervisory features.
5. Operation of system features on standby power, with primary power off.
6. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
7. Open initiating device circuits and verify that trouble signal actuates.
8. Open signaling line circuits and verify that trouble signal actuates.
9. Open and short notification appliance circuits and verify that trouble signal actuates.
10. Open and short (wire only) network communications and verify that trouble signals are received at network annunciators or reporting terminals.
11. Ground initiating device circuits and verify response of trouble signals.
12. Ground signaling line circuit and verify response of trouble signals.
13. Ground notification appliance circuit and verify response of trouble signals.
14. Check alert tone to alarm notification devices.
15. Check installation, supervision, and operation of intelligent smoke detectors using walk test.
16. Alarm conditions that the system is required to detect shall be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
17. When the system is equipped with optional features, consult the manufacturer manual to determine proper testing procedures.

C. Upon completion of installation of fire alarm equipment, provide to the IOR a signed, written statement confirming that fire alarm equipment was installed in accordance with the Specifications, Shop Drawings, instructions and directions provided by the manufacturer.

D. Demonstrate in presence of the IOR that circuit and wiring tests are free of shorts and grounds and that installation performs as specified herein and within manufacturer's guidelines.

E. Software Modifications:

1. If required, provide the services of a factory trained and authorized technician to perform system software modification, upgrades or changes. Response time of the technician to the Project site shall not exceed 24 hours.
2. If required, provide hardware, software, programming tools, and documentation necessary to modify the fire alarm network on the Project site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modification on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modification are being provided.

F. Complete the inspection and testing form as required by NFPA 72, and submit one copy of the completed form to the Architect and IOR.

3.3 OPERATING/SERVICE MANUALS

A. Submit 5 copies of service manuals including the following:

1. Detailed explanation of the operation of the system.
2. Instructions for routine maintenance.
3. Detailed instructions for repair of major components of the system.
4. Pictorial parts list and part numbers.
5. Pictorial and schematic electrical drawings of wiring systems, including operating and safety control panels, annunciators and major components.
6. Installation instructions for system components.
7. Programming instructions.
8. Program listing.
9. Final test report.
10. A single reproducible set of record drawings reflecting the system exactly as it was installed including exact location of components.
11. Provide software and passwords for programming.
12. Provide a print out of the entire programming of the system.

3.4 SPARE PARTS

A. The following new spare parts shall be furnished in unopened boxes:

1. One spare pull station.

2. Five percent spare smoke and heat detectors (minimum one spare smoke and heat detector per type).
3. Five percent spare audible devices (minimum one spare audible device per type).
4. Five percent spare strobe devices (minimum one spare strobe device per type).

3.5 INSTRUCTION PERIODS

A. Before Substantial Completion, provide three instruction periods, one for Project site Owner operators and system users and two for Owner maintenance personnel. As a minimum, the following shall be provided:

1. Provide a minimum of one 4 hour Project on-site instruction period for Owner operators including a complete set of written operating instructions, which shall remain on the Project site.
2. Provide a minimum of one 8 hour Project site instruction period for Owner maintenance personnel, consisting of a Project site walk-through indicating all device locations and demonstrating all system functions.
3. Provide a minimum of 16 hour classroom instruction period for owner maintenance personnel consisting of field programming, uploading and downloading data, troubleshooting, cable connections, installing and deleting pass-codes, adding or removing addressable devices or components and general operation. Eight hours of this training shall be actual hands-on training using a laptop computer on system mockups.
4. All instruction periods shall be scheduled and coordinated by the IOR.

3.6 PROTECTION

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

3.7 CLEANUP

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

END OF SECTION

SECTION 311000

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing/abandoning site utilities

B. Related Sections:

1. Division 01 Specifications apply to this section.
2. Division 02 Section and “Site Demolition” for demolition of site improvements.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

D. Tree-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

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

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions. Provide copy to Engineer of Record.

1.6 QUALITY ASSURANCE

A. Pre-installation Conference: Conduct conference at project site.

1.7 PROJECT CONDITIONS

A. Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
1. Protect improvements on adjoining properties, public right-of-way and on Owner's property.
2. Restore damaged improvements to their original condition, as acceptable to property owners. The full width of pavements damaged due to construction access and other construction-related activities shall be replaced with a structural section (pavement and base) at least equal to the adjacent existing section.
3. Protect existing utility lines indicated to remain. Notify Architect immediately of any damage to or encounter with an unknown existing utility line. Immediately repair damage to existing utility lines.

B. Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated

materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.

1. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
2. Provide protection for roots over 1-1/2 inch in diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt or other acceptable coating formulated to use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
3. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations in a manner acceptable to Architect. Employ a licensed arborist to repair damage to trees and shrubs.
4. Replace trees that cannot be repaired and restored to full-growth status, as determined by arborist.

C. 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 Owner or authorities having jurisdiction.

D. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Contractor shall delineate with construction stakes, the property line along the southeast side of the project.

2. Contractor shall document the pre-construction condition and photograph the existing CMU retaining wall along the southeast property line.

3. Do not proceed with work on adjoining property until directed by Architect.

E. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises per owner’s direction.

F. Utility Locator Service: Notify UNDERGROUND SERVICE ALERT for area where Project is located before site clearing.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earthwork."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

B. Tree Wound Paint: Bituminous based paint of standard manufacture specially formulated for the intended use.

PART 3 - EXECUTION

3.1 SITE CLEARING

A. Remove trees, shrubs, grass, and other vegetation, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site disposal of stumps and roots.

1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
2. Unless specifically designated to remain, strip the upper two inches (minimum) of soil containing vegetation and root growth within the Limits of Work shown on the Drawings.

B. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

1. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings. Removing abandoned underground piping or conduits interfering with construction is included under this Section.
2. Contractor shall refer to the project’s Asbestos Abatement Report for removal of asbestos containing materials and other potential hazardous materials.

C. Clearing and Grubbing: Clear site of trees, shrubs, and other vegetation, except for those indicated to be left standing.

1. Completely remove stumps, roots, and other debris protruding through ground surface.
2. Use only hand methods for grubbing inside drip line of trees indicated to remain.

3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
    a. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact each layer and compact in accordance with the requirements specified in Section 31 “Earthwork” to make the new surface conform with the existing adjacent surface of the ground.
4. Trim trees, designated to be left standing within the cleared areas, of dead branches 1-1/2 inches or more in diameter; and trim all branches to heights and in a manner as indicated. Neatly cut limbs and branches to be trimmed close to the bole of the tree or main branches. Paint cuts more than 1-1/4 inches in diameter with specified tree-wound paint.

D. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.
1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping.
    a. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
2. Stockpile topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, if required, to prevent wind and sediment erosion.
3. Dispose of unsuitable or excess topsoil as specified for disposal of waste material.

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

F. Locate and clearly identify trees, shrubs, and other vegetation to remain.

3.2 EXISTING UTILITIES

A. Arrange with Owner for disconnecting and sealing of all overhead and underground utilities that serve adjoining existing structures before site clearing.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.
2. Arrange with owner scheduling of utilities shut off.

C. Locate, identify, and disconnect utilities indicated to be removed.

D. Interrupting 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.

E. Excavate for and remove underground utilities indicated to be removed.

F. Contractor shall note that various unknown and undocumented underground utilities exist at the project site. Contractor shall ensure that utilities are inactive or shut off prior to removal or abandonment. Contractor shall document all found underground utilities and notify engineer of record for further direction.

3.3 SITE IMPROVEMENTS

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

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.4 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. 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. Do not interfere with other Project work.

END OF SECTION

SECTION 312000

EARTHWORK

PART 1 - GENERAL

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

1.2 SUMMARY

A. Section Includes:

1. Preparing and grading subgrades for slabs-on-grade, walks, pavements and landscaping
2. Excavating and backfilling for buildings and structures.
3. Drainage and moisture-control fill course for concrete slabs-on-grade.
4. Base course for concrete walks, asphalt and pavements.
5. Subsurface drainage backfill for walls and trenches.
6. Excavating and backfilling trenches for utilities and appurtenances outside building lines.

B. Related Sections:

1. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
2. Division 03 Section "Cast-in-Place Concrete" for granular course beneath the slab-on-grade.
3. Division 31 Section "Site Clearing" for site stripping, grubbing, and removal of above- and below-grade improvements and utilities.

1.3 REFERENCE SPECIFICATION

A. Perform all work in accordance with applicable provisions of "Standard Specifications for Public Works Construction", 2021 Edition, City of Rosemead Ordinances and Amendments, latest editions, UBC and 2022 CBC. Unless otherwise noted, mention herein of section numbers refers to sections of the Reference Specification. Where Reference Specification refers to "Agency", substitute the word "Owner". Where Reference Specification refers to "Engineer", substitute the word "Architect". Where Reference Specification is in conflict with these Specifications, these Specifications shall govern.

B. The recommendations found in the Geotechnical Investigation Report prepared by Associated Soils Engineering, Inc., dated August 2, 2023 apply to this Section.

1.4 DEFINITIONS

A. Backfill: Soil material or controlled low-strength 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: Aggregate layer placed between the subbase course and the surface pavement in paving system.

C. Bedding Course: Aggregate layer 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 when sufficient approved soil material is not available from excavations.

E. Drainage Fill: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered to subgrade elevations and the re-use or disposal of materials removed.

1. Authorized Additional Excavation: Excavation below subgrade elevations as directed by Architect.
2. Unauthorized Excavation: Excavation below subgrade elevations without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. 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.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

L. Compaction: Any method of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum dry density obtained by the test procedure described in ASTM D 1557 for general soil types abbreviated in this Specification as 90 percent of maximum dry density".

M. Hard Material: Weathered rock, dense consolidated deposits or conglomerate materials which are not included in the definition of "rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal

N. Lift: A layer or course of soil placed on top of previously prepared or placed soil in a fill or embankment.

O. Unsatisfactory Material: Soil or other material identified as having insufficient strength or stability to carry intended loads without excessive consolidation or loss of stability.

1.5 SUBMITTALS

A. Product Data: For each type of the following manufactured products required:
   1. Warning Tape
   2. Geotextile
   3. Water Quality Filter Media

B. Location of Borrow Materials.

C. Material Test Reports

D. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction

B. Testing and Inspection Service: Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.

C. Pre-excavation Conference: Before commencing earthwork, meet with representatives of the governing authorities, Owner, Architect, consultants, Geotechnical Engineer, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

1.7 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Architect and then only after acceptable temporary utility services have been provided.

1. Provide a minimum 48-hours' notice to the Architect and receive written notice to proceed before interrupting any utility.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies and owner to shutoff services if lines are active.

C. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving 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 Owner or authorities having jurisdiction.

D. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

E. Utility Locator Service: Notify UNDERGROUND SERVICE ALERT for area where Project is located before beginning earth moving operations.

F. Do not commence earth moving operations until temporary erosion/sedimentation control measures, specified in Division 01 are in place.

G. Groundwater was not encountered to the explored depth of 50 feet below the ground surface

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: Soil materials imported or excavated on the property determined to be suitable as referenced in the project Geotechnical Investigation Report; and approved by the Geotechnical Engineer.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 or a combination of these groups.

1. Refer to Geotechnical Investigation Report, for unsuitable materials and disposal methods for unsatisfactory soils.

D. Backfill and Fill Materials: Satisfactory soil materials.

E. Base Material: Shall conform to crushed aggregate base or crushed miscellaneous base, as specified on plan, in accordance with section 200-2.2 or 200-2.4, respectively, of the Reference Specification, and compacted to at least 95% of the maximum dry density as determined by ASTM Test Method D 1557.

F. Engineered Fill: Base Materials and compacted fill materials

G. Bedding Material: Shall be 1 sack slurry per soils report.

H. Drainage Fill: Washed, evenly graded mixture of 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 not more than 5 percent passing a No. 8 sieve

I. Filtering Material: Evenly graded mixture of natural or crushed gravel or crushed stone and natural sand, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 50 sieve.

J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
3. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
4. Tear Strength: 56 lbf (250 N); ASTM D 4533.
5. Puncture Strength: 56 lbf (250 N); ASTM D 4833.
6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.2 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.
6. White: Steam systems

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.
6. White: Steam Systems

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 earth moving operations.

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

C. Tree protection is specified in the Section 311000 "Site Clearing". Refer to landscape architectural plans for instructions.

D. Prepare subgrade and place base materials in accordance with sections 301-1.2 and 301-2, respectively, of the Reference Specification.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Dewatering shall be done in accordance with NPDES waste discharge requirements. Contractor shall obtain all necessary Dewatering permits from state and local jurisdictions.

C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. General: Excavation shall be to the contours, elevations and dimensions indicated. Keep excavations free from water and debris while construction is in progress. Notify the Owner immediately in writing where it becomes necessary to remove hard, soft,

weak, or wet material to a depth greater than indicated. Unless otherwise indicated, concrete placed below grade will be formed and excavations shall allow for placement and removal of forms. Side cuts shall be cribbed and shored as required.

B. Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions as described in the referenced Geotechnical Investigations Report.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials, replace with satisfactory soil materials.

2. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and rocks.

3. Rock fragments greater than 3 inches in diameter shall be taken off-site or placed in accordance with the recommendations of the Geotechnical Engineer in areas designated as suitable for rock disposal.

3.5 STABILITY OF EXCAVATIONS

A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.

B. Unshored Temporary Excavations:

1. Unshored temporary excavations may be sloped back at 1 to 1 (horizontal to vertical) or flatter up to 5 feet in height. Where sloped embankments are used, the tops of the slopes should be barricaded to prevent vehicles and storage loads within seven feet of the tops of the slopes. If the temporary construction slopes will be maintained during the rainy season, construct berms along the tops of the slopes where necessary to prevent run-off water from entering the excavation and eroding the slope faces.

3.6 EXCAVATION FOR STRUCTURES

A. Excavation Limits: Shall be to a tolerance of plus-or-minus 0.10 foot and shall extend three (3) feet laterally beyond the building limits at the excavation level and three (3) feet below existing grade, or deeper to excavate existing fill. The excavation side slopes shall not exceed a slope ratio of 1.5 to 1, horizontal to vertical, up to 5 feet in height, unless they are positively retained by shoring or other approved methods. Over-excavation side slopes may be vertical, as long as they are no higher than allowed by the State of California Construction Safety Orders, in which case they shall be no

steeper than 1.5 to 1. If cut below depths indicated, excavations shall be filled with concrete when the foundations or footings are placed. Revise first subparagraph below if footings and foundations are placed on engineered fill.

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.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.8 EXCAVATION FOR UTILITY TRENCHES

A. Excavation made with power-driven equipment is not permitted within two feet of any known utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, use hand or light equipment excavation. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines and other existing work affected by the excavation work of this Section until approval for backfill is granted by the geotechnical engineer. Immediately report damage to utility lines or subsurface construction to the Owner.

B. Where unidentified existing utilities are encountered, determine whether these are active or abandoned. Remove interfering portions of abandoned utilities and cap or plug open ends of pipe to remain. The cap or plug must seal the opening in such a manner that would permit remaining portions of the utility to be reactivated. Notify Owner for instructions on utilities which are determined to be active. Do not proceed without instructions, except to correct an immediate hazard or emergency condition. Relocation work performed on an active utility without obtaining prior approval from Owner shall be done at the Contractor's expense and liability.

C. In areas where compacted backfill has been placed, additional consolidation may occur after completion due to changes in moisture content and surcharge. Utility connections crossing this backfill, and improvements adjoining the building at the backfill line shall be installed taking into account this additional consolidation, or sufficient time shall be scheduled between backfilling operations and such improvements to allow this consolidation to take place. Damage to utilities or other improvements due to Contractor's negligence in regard to this paragraph shall be repaired at the Contractor's expense

D. Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, and any other damage. Repair and re-establish damaged or eroded grades and slopes and restore surface construction prior to acceptance

E. Cutting Pavement, Curbs, and Gutters: Saw cut with neat, parallel, straight lines one foot wider than trench width on each side of trenches and one foot beyond each edge of pits. If an existing pavement joint or cracked area is within two feet outside of a designated sawcut line shown on the Drawings, removal and resurfacing shall be to that joint, and/or shall include the crack or cracked area, unless otherwise approved by Architect.

F. Contractor shall pothole at all identifiable crossings of existing utilities prior to any trenching operations and provide Architect with a survey of the top elevations (and bottom elevations, if applicable), of possible interferences so that an evaluation of necessary adjustments to the current profile or alignment may be made. Additionally, Architect shall be given the opportunity to view possible conflicts in the field prior to providing revised designs.

G. Provide a minimum cover from grade of 3 feet for water mains and gas mains unless otherwise indicated on plans and details. Storm drains and sewers shall be to the depths indicated. Where settlements greater than the tolerance allowed herein for grading occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation.

H. Keep excavations free from water while construction is in progress.

I. Notify the Owner immediately in writing if it becomes necessary to remove rock or hard, unstable, or otherwise unsatisfactory material to a depth greater than indicated. Excavate large rock, boulders, and other unyielding material to depth at least 6 inches below the bottom of the pipe, conduit, duct and appurtenances, unless otherwise indicated or specified. Over-excavate soft, weak, or wet excavations to an depth at least 6 inches below the bottom of the pipe, conduit, duct or appurtenances unless otherwise indicated or specified.

J. Excavate trenches to indicated slopes, lines, depths, and invert elevations.

K. Excavate trenches to uniform widths to provide a working 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, except where sloping of sides is allowed. Sides of trenches shall not be sloped from the bottom of the trench up to the elevation of the top of the pipe. See plans for detail.

L. At the option of the Contractor, the excavations may be overcut to depth of not less than 4 inches and refilled to required grade as specified.

M. 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 stones and sharp objects to avoid point loading.

1. For pipes or conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.

2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.

3. Dig bell holes and depressions for joints after trench has been graded. Dimension of bell holes shall be as required for properly making the particular type of joint to ensure that the bell does not bear on the bottom of the excavation.

3.9 APPROVAL OF SUBGRADE

A. Notify Architect when excavations have reached required subgrade.

B. If and when Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Roll subgrade below the building slabs and pavements with a pneumatic-tired roller to identify soft pockets and areas of excess yielding. Do not roll wet or saturated subgrades.

1. Completely roll subgrade in one direction**,** repeating rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Unforeseen additional excavation and replacement material will be paid for according to Contract provisions for Changes in Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.10 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.11 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.

3.12 SOIL TREATMENT

A. All chemical applications used for soil treatment are subject to the approval of the Owner.

B. Recommended termiticide: Chlorpyrifos “Dursban TC”, or “Permetrin Torpedo” or “Dragnet”, or approved equal.

C. Do not apply soil treatment solution until excavating, filling and grading operations are completed and prior to any membrane being placed beginning concrete placement or other construction activities.

D. To ensure penetration, do not apply soil treatment to excessively wet soils or during inclement weather. Comply with handling and application instruction of soil toxicant manufacturer.

E. Remove foreign matter which could decrease effectiveness of treatment on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under foundations.

F. Apply soil treatment solution at rates recommended by soil toxicant manufacturer.

G. Allow not less than 12 hours for drying after application, before beginning concrete placement or other construction activities

H. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

3.13 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Acceptance of construction below finish grade including, where applicable, subdrainage, damp-proofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.14 UTILITY TRENCH BACKFILL AND COMPACTION

A. Backfilling of exterior utility trenches shall not be undertaken until geotechnical engineer has received 24-hours notice, until required tests and inspections have been completed, and until as-built location notes have been furnished. Remove uninspected backfill in accordance with requirements of this specification. Use hand-operated, plate-type, vibratory, or other suitable hand tampers in areas not accessible to larger rollers or compactors. Avoid damaging pipes and protective pipe coatings.

B. Place backfill material in accordance with Section 306-1.3.2 of the Reference Specifications and achieve at least 90% of the maximum density. The top 12 inches of backfill in the building or paved areas shall be compacted to 90% of maximum density.

C. Compaction by ponding or flooding will not be permitted.

D. Place and compact bedding course on rock and other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

E. Concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches of footings. Place concrete to level of bottom of footings

F. Provide 4-inch-thick concrete base slab support for piping or conduit less than 2'-6" below surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway base.

G. Place and compact initial backfill of satisfactory soil material or base material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

3.15 FILL

A. Preparation: Scarify and remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.
1. The scarified ground shall be brought to optimum moisture, mixed as required, and compacted as specified. If the scarified zone is greater than 12 inches in depth, the excess shall be removed and placed in lifts restricted to six inches.
2. 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 satisfactory soil material.
3. Under steps and ramps, use base materials
4. Under building slabs, use base materials
5. Under footings and foundations, use drainage fill materials.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.16 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.
a. Stockpile or spread and dry removed wet satisfactory soil material.

3.17 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 6 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. Keep rollers and other heavy equipment at least 18 inches from footings, foundations, piers and walls of buildings and accessory construction. Use mechanical and hand tampers weighing at least 90 pounds with a maximum face area of 48 inches square to compact backfill within 18 inches of construction and where access is restricted.

C. Percentage of Maximum Dry Density Requirements: Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. For general site fills, compact each layer of backfill or fill material at 90 percent maximum dry density.

2. Under structures, building slabs, and steps, scarify and recompact top 24 inches below footing or slab and each layer of backfill or fill soil material at 95 percent maximum dry density.
3. Under walkways and paving, scarify and recompact top 12 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent maximum dry density.
4. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent maximum dry density.

3.18 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.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
3. If necessary, the Contractor's selected equipment and construction procedure shall be altered, changed or modified in order to meet the specified compaction requirements. Flooding and water jetting is prohibited.

B. Site Rough 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: ± 0.10 foot, unless otherwise indicated.
2. Concrete Walks: ± 0.025 foot.
3. Pavements:
    a. Concrete: 0.025 foot minus, with no high spots.
    b. Asphalt: 0.05 foot minus, with no high spots.

C. Grading inside Building Lines: Finish subgrade to a tolerance of ½ inch when tested with a 10-foot straightedge.

3.19 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Division 33 Section "Storm Drainage."

B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches x 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer to 90 percent of maximum dry unit weight

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer to 90 percent of maximum dry unit weight
2. Place and compact impervious fill over drainage backfill in 6-inch thick compacted layers to final subgrade.

3.20 BASE COURSES UNDER PAVEMENTS AND WALKS

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. Compact base courses at optimum moisture content to required grades, lines, cross sections and thickness to not less than 95 percent of ASTM D 4254 relative density.

2. Shape base to required crown elevations and cross-slope grades.

3. When thickness of compacted base course is 6 inches or less, place materials in a single layer.

4. When thickness of compacted base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.21 PAVEMENT REPAIR

A. Repair or patch asphalt pavement as specified in Section 321216 Asphalt Paving. Repair or patch concrete pavement, curbs and gutters as specified in Section 321313 Concrete Paving. Do not repair pavement until trench has been backfilled and compacted as herein specified. As a minimum, maintain one-way traffic on roads and streets crossed by trenches.

3.22 FIELD QUALITY CONTROL

A. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
   1. Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2937 (drive cylinder method), as applicable.
      a. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017
      b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Architect.

B. 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.

C. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.

D. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 100 feet or less of wall length, but no fewer than two tests along a wall face.

E. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but no fewer than two tests.

F. 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 materials to depth required; recompact and retest until specified compaction is obtained.

3.23 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.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact at optimum moisture content to the required density.

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.

3.24 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 312219

FINISH GRADING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes the following:
   1. Weeding.
   2. Finish grading of lawn and planting areas.

B. Related Sections include the following:
   1. 312000: Earthwork

1.3 DEFINITIONS

A. Finish grading: finish grading shall consist of adjusting and finishing soil surfaces with site or imported topsoil, raking grades to a smooth, even, uniform plane. Remove and legally dispose of all extraneous matter off site. Facilitate natural run-off water and establish grades and drainage indicated as part of the contract work.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Obtain imported topsoil from approved local sources.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of conditions: Prior to commencing the finish grading, review the installed work of other trades and verify that their work is complete.
   1. Rough Grading: Grading in planting areas (except raised planter areas) shall be established to within plus or minus 0.10 foot prior to beginning of finish grading.

B. Import topsoil only when necessary to supplement site soil to achieve grades shown on drawings, or if site soil is unsuitable for planting.

3.2 PREPARATION

A. Weeding: Before finish grading, weeds and grasses shall be dug out by the root or sprayed with an herbicide and disposed of off-site. This procedure is outlined under the Landscape Planting Section.

B. Debris: Remove stones and debris 1 inch in diameter and greater and clumps of earth that do not break up. Dispose of off-site.

3.3 INSTALLATION

A. General: When rough grading and weeding have been completed, and the soil has dried sufficiently to be readily worked, lawn and planting areas shall be graded to the elevations indicated on the Drawings.
   1. Grades indicated on Drawing are grades that will result after thorough settlement and compaction of the soil.
   2. Grades not otherwise indicated shall be uniform finish grades and, if required, shall be made at the direction of the Architect.
   3. Finish grades shall be smooth, even, and a uniform plane with no abrupt change of surfaces.
   4. Soil areas adjacent to buildings shall slope away from the building to allow a natural run-off of water, and surface drainage shall be directed as indicated on the drawings by remodeling surfaces to facilitate the run off water at 2% minimum grade.
   5. Low spots and pockets shall be graded to drain properly.

B. Drainage: Finish grade with proper slope to drains.
   1. Flow lines, designated or not, shall be graded and maintained to allow free flow of surface water.
   2. If any drainage problems arise during construction period due to Contractor's work (such as, but not limited to, low spots, slides, gullies and general erosion), the Contractor shall be responsible for repairing these areas to a condition equal to their original condition, and in so doing shall prevent further drainage problems from occurring.

C. Toe of slope: To prevent soil creep or erosion across pavement, where pavement (walk, curb, etc.) is at the toe of a slope, finish grade is to level out or swale slightly at least 6” before reaching pavement.

D. Moisture Content: The soil shall not be worked when the moisture content is so great that excessive compaction occurs, nor when it is so dry that dust may form in the air or

that clods do not break readily. Water may be applied, if necessary, to provide moisture content for tilling and planting operations. It is the Contractor’s responsibility to control dust that is spread as a result of grading operations.

E. Grades: The finish grade in areas to be planted with turf shall be 2 inches below grade of adjacent pavement and walks unless shown otherwise on landscaping plans and details.

F. Compaction: Soils in planted areas shall be loose and friable, yet firm enough that no settling occurs from normal foot traffic or irrigation.

3.4 FIELD OBSERVATION

A. It is the Contractor's responsibility to contact the Architect 48 hours or two working days in advance of each agreed observation or conference.

B. Schedule for On-Site Reviews: at completion of finish grading and prior to any planting operations.

END OF SECTION

SECTION 321216
ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Hot-mix asphalt paving.
   2. Hot-mix asphalt patching.
   3. Hot-mix asphalt overlays.
   4. Asphalt surface treatments:
      a. Fog seals.
      b. Slurries.
   5. Pavement-marking paint.

B. Related Sections include the following:
   1. Section 31 20 00 "Earthwork" for aggregate subbase and base courses and aggregate pavement shoulders.
   2. Section 32 13 13 “Concrete Paving” for pavement marking on portland cement concrete pavement and herbicide treatment under portland cement concrete paving.
   3. Section 32 17 23 "Painted Pavement Marking" for pavement marking requirements.

1.3 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the state or of authorities having jurisdiction.
   1. Reference Specification: Perform all work in accordance with applicable provisions of "Standard Specifications for Public Works Construction", 2021 Edition. Unless otherwise noted, mention herein of section numbers refers to sections of the Reference Specification. Where Reference Specification refers to "Agency", substitute the word "Owner". Where Reference Specification refers to "Engineer", substitute the word "Architect". Where Reference Specification is in conflict with these Specifications, these Specifications shall govern.
   2. Measurement and payment provisions and safety program submittals included in Reference Specifications do not apply to this Section.

1.4 SUBMITTALS

A. Product Data: For each product specified. 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. Job-Mix Designs: For each job mix proposed for the work.

D. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate dedicated handicapped spaces with international graphics symbol.

E. Samples: 12 by 12 inches (300 by 300 mm) minimum, of paving fabric.

F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

G. Material Test Reports: Indicate and interpret test results for compliance of materials with requirements indicated.

H. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.
   1. Firm shall be a registered and approved paving mix manufacturer with authorities having jurisdiction or with the DOT of the state in which Project is located.

C. Testing Agency Qualifications: Demonstrate to Architect's satisfaction, based on Architect's evaluation of criteria conforming to ASTM D 3666, that the independent testing agency has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

D. Regulatory Requirements: Conform to applicable standards of authorities having jurisdiction for asphalt paving work on public property.

E. Asphalt-Paving Publication: Comply with AI's "The Asphalt Handbook," except where more stringent requirements are indicated.

F. Preinstallation Conference: Review methods and procedures related to asphalt paving including, but not limited to, the following:
   1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
   2. Review condition of substrate and preparatory work performed by other trades.
   3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
   4. Review and finalize construction schedule for paving and related work. Verify availability of materials, paving Installer's personnel, and equipment required to execute the Work without delays.
   5. Review inspection and testing requirements, governing regulations, and proposed installation procedures.
   6. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
   1. Prime and Tack Coats: Minimum surface temperature of 60 deg F (15.5 deg C).
   2. Slurry Coat: Comply with weather limitations of ASTM D 3910.
   3. Asphalt Base Course: Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.
   4. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.5 deg C) at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4 deg C) for oil-based

materials, 50 deg F (10 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: Sound; angular crushed stone; crushed gravel; or properly cured, crushed blast-furnace slag; complying with ASTM D 692.

C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone; gravel, properly cured blast-furnace slag, or combinations thereof; complying with ASTM D 1073.
   1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242.

2.2 ASPHALT PAVEMENT MATERIALS

A. Asphalt Pavement Leveling Course: Conform to Viscosity Grade B-PG 64-10 in section 203-1.2 and section 203-6 of the Reference Specification.

B. Asphalt Pavement Wearing (Surface) Course: Conform to Viscosity Grade III C2-PG 64-10, C3-PG 64-10 in section 203-1.2 and section 203-6 and section 400-4 to be used with Class III asphalt of the Reference Specification.

C. Prime Coat: Grade SC-70 liquid asphalt conforming to section 203-2 of the Reference Specification.

D Tack Coat: Emulsified asphalt grade SS-1h conforming to section 203-3 of the Reference Specification.

E. Asphalt Paint: Conform to ASTM D41 or D43 per section 203-8 of the Reference Specification.

F. Slurry Seal: Emulsified asphalt grade [SS-1h] [CSS-1h] and aggregate conforming to section 203.5 of the Reference Specification.

G. Asphalt Cement: ASTM D 3381 for viscosity-graded material; ASTM D 946 for penetration-graded material.

H. Asphalt Cement: ASTM D 3381 for viscosity-graded material.

I. Undersealing Asphalt: ASTM D 3141, pumping consistency.

J. Prime Coat: ASTM D 2027; medium-curing cutback asphalt; MC-30, MC-70, or MC-250.

K. Prime Coat: Asphalt emulsion prime conforming to state DOT requirements.

L. Prime Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

M. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

N. Fog Seal: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

O. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wettable powder form.

B. Sand: ASTM D 1073, Grade Nos. 2 or 3.

C. Paving Geotextile: Nonwoven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.

D. Pavement-Marking Paint: Alkyd-resin type, ready-mixed, complying with FS TT-P-115, Type I, or AASHTO M-248, Type N.

E. Pavement-Marking Paint: Latex, water-base emulsion, ready-mixed, complying with FS TT-P-1952.
   1. Color: As indicated.
   2. Color: White (for parking stalls, other than handicapped).
   2. Color: Yellow (for parking stalls, other than handicapped).
   3. Color: Blue (for pavement markings identifying handicap parking)
   4. Color: Red (for “No Parking” areas as shown)

F. Glass Beads: AASHTO M-247.

2.4 MIXES

A. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI's "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:
   1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
   2. Base Course: As indicated.
   3. Surface Course: As indicated.

B. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and designed according to procedures in AI's "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types."
   1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
   2. Provide mixes complying with the composition, grading, and tolerance requirements of ASTM D 3515 for the following nominal, maximum aggregate sizes:
      a. Base Course: 1 inch (25 mm).
      b. Surface Course: 1/2 inch (13 mm).

C. Emulsified-Asphalt Slurry: ASTM D 3910, consisting of emulsified asphalt, fine aggregates, and mineral fillers and as follows:
   1. Composition: Type 1.
   2. Composition: Type 2.
   3. Composition: Type 3.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Subgrade, Subbase, and Base:
   1. Proof-roll prepared subgrade and base using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

C. Notify Architect in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.2 COLD MILLING

A. Clean existing paving surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement, including hot-mix asphalt and, as necessary, unbound-aggregate base course, by cold milling to grades and cross sections indicated.
   1. Repair or replace curbs, manholes, and other construction damaged during cold milling.

B. Cold mill existing asphalt concrete pavement in accordance with section 302-5.2 of the Reference Specification.

3.3 PATCHING AND REPAIRS

A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.
   1. Tack coat faces of excavation and allow to cure before paving.
   2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
   3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
   1. Pump hot undersealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
   2. Remove disintegrated or badly broken pavement. Prepare and patch with hot-mix asphalt.

C. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.
   1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

D. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch (6 mm). Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

E. Asphalt paint: Apply uniformly to existing surfaces of previously constructed asphalt or Portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m) of surface.
   1. Allow asphalt paint to cure undisturbed before paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 SURFACE PREPARATION

A. General: 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.

B. 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.
   1. Mix herbicide with prime coat when formulated by manufacturer for that purpose.

C. Prime Coat: Apply uniformly over surface of compacted-aggregate base at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72 hours minimum.
   1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
   2. Protect primed substrate from damage until ready to receive paving.

D. Prime Coat: Comply with section 302-5.3 of the Reference Specification. Apply primer at a rate of between 0.20 and 0.25 gallons per square yard to top surface of base course prior to asphalt placement.

E. Tack Coat: If a leveling course has been used for construction traffic, apply tack coat to all leveling course surfaces in accordance with section 302-5.4 of the Reference Specification at a rate of 0.10 gallons per square yard.

3.5 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt mix 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. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
   2. Place hot-mix asphalt surface course in single lift.
   3. Spread mix at minimum temperature of 250 deg F (121 deg C).
   4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.

5. 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 (3 m) wide, except where infill edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt base course for a section before placing asphalt surface course.

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.

D. The asphalt pavement shall be completed in phases; the leveling course during construction for temporary construction traffic and storage of materials and; the wearing (surface) course just prior to turnover to Owner; unless the entire paving operation is completed just prior to turnover to the Owner such that no construction traffic or storage of materials shall be allowed on the finished pavement surface after its completion. Contractor shall schedule final surface course paving operations so that the required waiting period specified in the Division 2 Section "Pavement Marking" will allow project completion within the specified time.

E. Construct asphalt pavement in accordance with section 302-5 of the Reference Specification and as shown on the Drawings.

F. Two Layer Method: The leveling course shall be installed to elevations which will allow the future placement of a wearing (surface) course no thinner than 1-1/2 inches. Prior to placing the wearing (surface) course, repair all areas damaged during construction use, thoroughly clean the leveling course of all loose material and place a tack coat pursuant to paragraph 3.4 D. herein.

3.6 JOINTS

A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat.
   2. Offset longitudinal joints in successive courses a minimum of 6 inches (150 mm).
   3. Offset transverse joints in successive courses a minimum of 24 inches (600 mm).
   4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.

6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.7 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. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and rerolling to required elevations.

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 at least 95 percent of the Hveem density (ASTM D 2726-05a).

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt, with a thickness one inch greater than the existing, and to match existing finish surface grades such that no local ponding of water will result. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Leveling Course: ±1/2 inch (13 mm).
   2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
   1. Leveling Course: 1/4 inch (6 mm).
   2. Surface Course: 1/8 inch (3 mm).
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.9 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. (0.45 to 0.70 L/sq. m) to existing asphalt pavement and allow to cure. Lightly dust areas receiving excess fog seal with a fine sand.

B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.
   1. Roll slurry seal to smooth ridges and provide a uniform, smooth surface.
   2. Slurry seal to be applied min. 30 days after completion of asphalt pavement.

C. Slurry seals: Apply in accordance with section 302-4 of the Reference Specification.

3.10 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow paving to cure for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

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 (0.4 mm).
   1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).

E. Comply with paint manufacturer's maximum drying time requirements to prevent undue softening of bitumen and pick-up, displacement, or discoloration of pavement marking by vehicular traffic.

F. Paint pavement, curbs and other surfaces, as shown on the Drawings. Painting shall be straight, uniform, exact and sharp without blobs at the start and finish. Edges shall be even, accurate, symmetrical and free of fuzziness.

G. Apply markings for disabled access symbols in accordance with State of California Building Code, Part 2, Title 24, CCR.

H. Where work consists of modifications of, or additions to existing parking striping, match existing color and width of lines as closely as possible.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
   1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.

B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

E. Perform flood tests on asphalt paved areas to determine if surface grades allow proper runoff of surface water and if drainage devices function properly. Such tests shall be conducted in the presence of the Architect and the Owner. Promptly correct paving work found to be defective due to ponding of water or improper drainage.

F. In-Place Density tests will be performed using nuclear gauge (ASTM D 2950-05) to verify at least 95 percent relative compaction of the Hveem density has been achieved. Representative samples of the AC will be collected and tested in the laboratory for Hveem density (ASTM D 2726-05a), theoretical maximum density (ASTM D 2041-03a), stability (ASTM D 1560-05), gradation (ASTM C 136-05), and asphalt content (ASTM D 6307-05).

G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION

SECTION 321313
CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes exterior Portland cement concrete paving for the following:
   1. Curbs and gutters.
   2. Walkways.
   3. Driveways
   3. Concrete pavement.
   4. Concrete wheel stops

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 312000: Earthwork for subgrade preparation, grading and base course.
   2. Section 321373: Paving Joint Sealants for joint fillers and sealants within concrete paving and at joints with adjacent construction.

1.3 SYSTEM DESCRIPTION

A. Provide concrete pavement according to the materials, workmanship, and other applicable requirements of the following standard specifications:
   1. Reference Specification: Perform all work in accordance with applicable provisions of "Standard Specifications for Public Works Construction", 2021. Unless otherwise noted, mention herein of section numbers refers to sections of the Reference Specification. Where Reference Specification refers to "Agency", substitute the word "Owner". Where Reference Specification refers to "Engineer", substitute the word "Architect". Where Reference Specification is in conflict with these Specifications, these Specifications shall govern.
   2. Measurement and payment provisions and safety program submittals included in Reference Specifications do not apply to this Section.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Design mixes for each class of concrete. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Description of Methods and Sequence of Placement. For each type of specially-finished concrete provide description of methods and sequence of placement.

D. Submit manufacturer's product data for the following:
   1. Form release agent.
   2. Concrete coloring additive.
   3. Prefabricated control joint.
   4. Preformed joint filler.
   5. Sealants.
   6. Slip plane joint.
   7. Concrete mix design.

1.5 QUALITY ASSURANCE

A. Concrete Standards: Comply with provisions of the following standards, except where more stringent requirements are indicated.
   1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
   2. ACI 318, "Building Code Requirements for Reinforced Concrete."
   3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
   4. Standard specifications for PWC (Green Book) latest edition, section 201-1.

B. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. Paving work, base course etc., shall be done only after excavation and construction work, which may damage them, have been completed. Damage caused during construction shall be repaired before acceptance.

D. Existing paving area shall, if damaged or removed during the course of this project, be repaired or replaced under this section of the specification. Workmanship and materials for such repair and replacement, except as otherwise noted, shall match as closely as possible those employed in existing work.

E. Pavement, base, or subbase shall not be placed on a muddy subgrade.

F. Provide sawcut control joints as required to construct 100 sq. ft. maximum panel sizes, unless otherwise called on the plans.

G. Concrete Testing Service: Engage a qualified independent testing agency to perform materials evaluation tests and to design concrete mixes.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

1.7 TESTING AND INSPECTION

A. The owner reserves the right to inspect and test paving and associated work.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
   1. Use flexible or curved forms for curves of a 100-foot or less radius.

B. Form Release Agent: Provide commercial formulation form-release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
      a. Debond Form Coating, L & M Construction Chemicals.
      b. Crete-Lease 880 VOC, Cresset Chemical Company.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars and Tie Bars: ASTM A 615, Grade 40 for #3 bars and Grade 60 for bars larger than #3, deformed.

B. Plain, Cold-Drawn Steel Wire: ASTM A 82.

C. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

D. Dowel Sleeves: Speed Dowel, Aztec Concrete Accessories, Inc.

E. Hook Bolts: ASTM A 307, Grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in position

during concreting operations, and to permit removal without damage to concrete or hook bolt.

F. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Use wire bar-type supports complying with CRSI specifications.
   1. Use supports with sand plates or horizontal runners where base material will not support chair legs.

G. Welded wire fabric reinforcement shall conform to the applicable requirements of ASTM A185. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type II
   1. Use one brand of cement throughout Project. Coordinate with Division 3 Section "Cast-In-Place Concrete."

B. Normal-Weight Aggregates: ASTM C 33, Class 4M non-reactive, and as follows. Provide aggregates from a single source.
   1. Maximum Aggregate Size: 1-inch.
   2. Do not use fine or coarse aggregates that contain substances that cause spalling.
   3. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.

C. Water: Potable.

D. Admixtures: Comply with requirements specified in Division 3 Section "Cast-In-Place Concrete."
   1. Do not use admixtures containing calcium chloride or chloride ions.

2.4 COLOR ADMIXTURE

A. Color admixture shall be suitable for flatwork concrete and shall meet or exceed the requirements set by Portland Cement Association (PCA) and ATSM C 494.

B. Color admixture shall be of a type and quality which will not adversely affect workability, setting, or strength of concrete. Color pigments shall consist of chemically inert, non-fading, alkali-fast mineral oxides, finely ground and specially prepared for the use in both cement and mortar. Admixture shall not contain calcium chloride.

C. Color admixture shall be Chromix admixture, manufactured by L.M. Scofield Company, Los Angeles, CA 90040, or approved equal.

D. Mix design shall conform to manufacturer's recommendations, and directions of the Architect to achieve proposed color. Strictly monitor additive / cement ratio throughout job to ensure uniform color.

2.5 CURING MATERIALS

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
1. Waterproof paper.
2. Polyethylene film.
3. White burlap-polyethylene sheet.

C. Liquid Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B. Moisture loss not more than 0.55 kg/sq. meter in 72 hours when applied at a rate of 200 sq. ft./gal.
1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
2. Products: Subject to compliance with requirements, provide one of the following or approved equal:
   a. L & M Cure R, L & M Construction Chemicals, Inc.
   b. 1100-Clear, W.R. Meadows, Inc.
3. Do not use sodium silicate type curing agents.

D. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
1. Products: Subject to compliance with requirements, provide one of the following or approved equal:
   a. Eucobar; Euclid Chemical Co.
   b. E-Con; L&M Construction Chemicals, Inc.
   c. Confilm; Master Builders, Inc.

2.6 RELATED MATERIALS

A. Bonding Agent: Acrylic or styrene butadiene, complying with ASTM C 1059, Type 2.

B. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.

C. Products: Subject to compliance with requirements, provide one of the following or approved equal:
   1. Bonding Agent:
      b. SBR Latex; Euclid Chemical Co.
      c. Daraweld C; W.R. Grace & Co.
      d. Everbond; L&M Construction Chemicals, Inc.
      e. Acryl-Set; Master Builders Inc.
   2. Epoxy Adhesive:
      a. Burke Epoxy M.V., The Burke Co.
      b. Concresive Standard Liquid; Master Builders, Inc.
      c. Rezi-Weld 1000; W.R. Meadows, Inc.

D. Concrete Sealer: Water-based, deep penetrating, non-staining, non-darkening silane micro emulsion.
   1. Positive chloride-ion screening, prevents water intrusion, minimizes rebar corrosion and potential concrete spalling, and protects against damaging effects of alkalis and other contaminants.
   2. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
   3. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:
      a. Pentane WB, L & M Construction Chemicals, Inc. This product is intended to establish the characteristics and level of quality intended for this Project.

D. Expansion and Isolation Joint Fillers: ASTM D 1751, cellulosic fiber.

2.7 CONCRETE MIX

A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use a qualified independent testing agency for preparing and reporting proposed mix designs.
   1. Do not use the Owner's field quality-control testing agency as the independent testing agency.

B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:
   1. Compressive Strength (28-Day): 2500 psi for concrete for sidewalks; 3200 psi for concrete in traffic areas, curbs and gutters.
   2. The minimum cement content shall be 5-1/4 sacks per cubic yard.
   3. The maximum concrete slump shall be 3 inches ±1/2 inch, for all walks; and 4 inches ±1 inch for all other Portland cement concrete paving.
   4. Water/Cement Ratios:

a. 0.50 maximum for all site concrete.

C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.

D. Admixtures: Comply with requirements specified in Division 3 Section "Cast-In-Place Concrete".

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2.9 GROUT

A. Grout shall be mixed in the proportions of one part Portland cement to two parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Sand for grout shall be "Fine Aggregate", conforming to ASTM C 33.

B. Non-shrink grout shall be pre-mixed non-shrinking, high strength grout. Compressive strength in 28 days shall be 5,000 psi minimum, but in no case less than the specified strength of the adjacent concrete. Manufacturer shall provide evidence that the material meets the requirements of the COE CRD-C 621 (558). Grout permanently exposed to view shall be non-oxidizing; metallic grout may be used in other locations.
1. Non-shrink grout shall be one of the following or approved equal:

Manufacturer	Product
Gifford-Hill Co.	Supreme
Master Builders Co.	Embeco
U.S. Grout Corporation	Five Star Grout

2.10 SANDBLASTING MATERIAL

A. Material for sandblasting shall be 16/20 mesh sand.

2.11 HERBICIDE TREATMENT

A. Commercial chemical for weed control, registered by Environmental Protection Agency. Provide granular, liquid, or wettable powder form.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to the following:
      a. Ciba-Geigy Corp.
      b. Dow Chemical U.S.A.
      c. E.I. Du Pont de Nemours & Co., Inc.
      d. FMC Corp.
      e. Thompson-Hayward Chemical Co.
      f. U.S. Borax and Chemical Corp.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Areas to be paved shall be compacted and brought to subgrade elevation per soils report before work of this section is performed. Final fine grading, filling, and compaction of areas to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to this Section.

C. Subgrade of areas to be paved shall be re-compacted per soils report.

D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade, base, or pavement, subsequent backfill and compaction shall be performed per soils report.

E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and re-compacted before placing pavement.

F. Materials shall not be stored or stockpiled on subgrade.

G. Disposal of debris and other material excavated under this section, and material unsuitable for or in excess of requirements for completing work of this section shall be disposed of off-site.

H. Prepared subgrade will be inspected by Soils Engineer. Subgrade shall be approved before installation of gravel base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this section of the specification.

I. Proof-roll subgrade or base surface prepared by others to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

J. Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subgrade prior to installation of base course.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork and screeds for grade and alignment to following tolerances:
   1. Top of Forms: Not more than 1/8 inch in 10 feet.
   2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.

C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.3 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, or other bond-reducing materials. Where there is delay in placing concrete after reinforcement is in place, bars shall be re inspected and cleaned when necessary.

C. Any bar showing cracks after bending shall be discarded.

D. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

F. After forms have been coated with form release agent, but before concrete is placed, reinforcing steel anchors shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Architect.

3.4 JOINTS

A. General: Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
   1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.
   2. Make joints, including sawed joints, full depth required and from edge to edge of paving.

B. Control Joints: Provide weakened-plane control joints, sectioning concrete into areas as shown on Drawings. Construct control joints for a depth equal to at least 1/4 of the concrete thickness, as follows:

   1. Tooled Joints: Form control joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.
   2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into hardened concrete when cutting action will not tear, abrade, or otherwise damage surface and before development of random contraction/shrinkage cracks.
   3. Inserts: Form control joints by inserting pre-molded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.

C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.

   1. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
   2. Provide tie bars at sides of paving strips where indicated.
   3. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

D. 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.

E. Expansion Joints: Form expansion joints of preformed joint filler strips.

1. Install dowel bars and support assemblies at joints where indicated. When no sleeves are used, lubricate or asphalt-coat one half of dowel length to prevent concrete bonding to one side of joint.
2. Where spacing is not shown, locate expansion joints at 32-foot maximum spacing or less to fit the control joints pattern.

F. Installation of joint fillers and sealants is specified in Section "Joint Sealants".

1. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.

2. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
3. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

G. Where plastic "zip strips" are used to construct concrete joints, cut and remove, as a minimum, the top 1/4 inch of these strips after concrete has cured, and coordinate installation of joint filler as specified in Section “Joint Sealants”.

3.5 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Moisten subgrade or base to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

C. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.

D. 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.

E. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

F. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.

G. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.

H. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.

I. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

J. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

A. Float Finish: Begin floating when bleed water sheen has disappeared, and the 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 within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.
   1. Burlap Finish: Drag a seamless strip of damp burlap across concrete, perpendicular to line of traffic, to provide a uniform gritty texture finish.
   2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across concrete surface perpendicular to line of traffic to provide a uniform fine line texture finish.
   3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
   4. Do not use troweling machines within 12 inches of electrical junction and outlet boxes which are set to finish flush with concrete slabs. Float and trowel such areas by hand with wood floats and steel trowels, taking care to see that concrete is finished flush with box cover and matches adjacent surfaces.

B. Slip-Resistant Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on pavement surface in accordance with manufacture'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 non-slip aggregate

C. Finishing formed surfaces:
   1. Curb forms shall leave a smooth face.
   2. Remove all fins.

D. Provide steel trowel finish on tops of curbs and flow lines of curbs, gutters and integral curb and gutters.

E. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.

1. Radius: 1/4 inch.
2. Radius: 3/8 inch.

F. Finish surfaces to produce a uniform appearance throughout area involved and throughout adjacent areas with the same treatment. Provide slip resistance finish to comply with ADA requirements.

G. Sandblast finish shall be consistent finish throughout and match approved mock-up.

H. Where concrete finishing occurs adjacent to finished metal or other surfaces, particularly where serrated or indented surfaces occur, remove all traces of cement film before allowing to harden.

I. Apply integral wood float and broom finish to the all concrete pavements and walkways, unless otherwise shown on the Drawings.
1. After screeding and compacting, finish with a wood float using a circular motion to produce a uniform texture and finish throughout.
2. For vehicular traffic areas, the finish shall be coarse enough to provide a non-slip surface with a minimum static friction coefficient of 0.6.
3. For pedestrian traffic areas, finish shall be a non-slip surface with a minimum static coefficient of friction of 0.6.
   a. For ramps, the static coefficient of friction shall be a minimum of 0.8. Ramps are defined as any sloping path of travel with a slope in the direction of travel of 5.0%, or greater.
4. Tests for coefficient of friction shall be either ASTM C-1028 (field test) or ASTM D-2047 (laboratory test).

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.

B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

E. Spray-apply concrete sealer to all concrete pavement. Comply with sealer manufacturer's application instructions.

3.8 CURING COLORED CONCRETE

A. Colored concrete shall not, under any circumstances, be cured using water fog misting or ponding, burlap, plastic sheeting, or other wet covering.

B. Curing material and method shall be in strict conformance with manufacturer's guidelines and recommendations.

C. Only if additional protection is absolutely required, the surface should remain uncovered for at least 4 days, after which time new and unwrinkled non-staining reinforced waterproof kraft curing paper may be used.

3.9 FIELD QUALITY CONTROL TESTING

A. The Owner will employ a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include the following:
1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
a. Slump: ASTM C 143; one test at point of placement for each compressive-strength test but no less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
b. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test but no less than one test for each day's pour of each type of air-entrained concrete.
c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below and when 80 deg F (27 deg

C) and above, and one test for each set of compressive-strength specimens.

d. Compression Test Specimens: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless directed otherwise. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.

e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. Test one specimen at 7 days, test two specimens at 28 days, and retain one specimen in reserve for later testing if required.

2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
3. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

B. Test results will be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in paving, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day and 28-day tests.

C. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

D. Additional Tests: The testing agency will make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

E. Manufacturer's Field Service: When placing integral colored concrete, arrange for the services of a qualified technical representative of the color pigment manufacturer,

equipped with wet-batch color control test devices to ensure concrete of uniform color and matching approved mock-up.

3.10 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section. Concrete which is not true to line and plane, which is not thoroughly troweled and properly surfaced as required, which varies in excess of 1/4-inch along a 10-foot straight edge, which is scuffed or has a rough top surface, except where required, or which does not connect properly to adjoining work, does not slope as required for drainage or is not properly cured, will be deemed defective.

1. General: Patch defective areas immediately following form removal. Remove defective concrete to a width and depth necessary for proper patching, but in no case less than 1 inch deep. Make the walls of the cut area perpendicular to the surface and do not feather out the edge. Dampen the patch area and the adjacent area 6 inches around the patch area.
2. Exposed concrete: Prepare a patching mortar of one part Portland cement, adjusted to match the color of the surrounding concrete, and 2-1/2 parts sand with the least water required to produce a workable mass. Re-work this mortar until it is the stiffest consistency that will permit placing. Brush the patch area with a bond of neat cement and water paste and apply patching mortar when the water sheen is off the bond. Strike off the mortar slightly higher than the surrounding surface, let set for 1 hour and finish flush with the surrounding surface.

B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 321323
SITE CONCRETE

1.GENERAL

1. SUMMARY

A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work for Cast-in-Place Site Concrete Paving, as shown in the Contract Drawings, and as specified herein this Section.

B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
   1. Cast-in-Place Concrete Driveways.
   2. Cast-in-Place Concrete Steps.
   3. Cast-in-Place Concrete Ramps.
   4. Cast-in-Place Concrete Curbs and Gutters.
   5. Cast-in-Place Concrete Walkways, Patios, Courtyards, and/or Plazas.
   6. Cast-in-Place Concrete Sidewalks.
   7. Fence Post footings, catch basins, pipe bedding and encasements, thrust blocks, transition structures, equipment pads.
   8. Jointing (Expansion Joints, Contraction Joints, Isolation Joints, Keyway/Construction Joints and/or Architectural Score Joints).
   9. Joint Sealants.
   10. Compacted Sub-Surface Materials.
   11. Concrete Pavement Finishes.
   12. Concrete Paving Surface Sealants.

C. Related Sections: The following Sections contain requirements that relate to Work in this Section:
   1. Section 32 1323: Site Concrete (misc. footings, headers, foundations, etc.)
   2. Section 31 22 00: Grading.
   3. Section 31 24 13: Excavating, Backfilling and Compacting or Pavement

D. See Division 1 Section “LEED Requirements Summary” for recommendations and requirements for recycled content, regional materials, FSC certified formwork, low-emitting concrete finishes and LEED submittal requirements for all concrete materials.

2. DEFINITIONS AND APPLICABLE STANDARDS

A. References:
   1. AASHTO – American Association of State Highway and Transportation Officials.
   2. ADAAG – American with Disabilities Act Accessibility Guidelines.
   3. ACI – American Concrete Institute.

4. ANSI – American National Standards Institute.
5. ASTM – American Society for Testing and Materials.
6. CRSI – Concrete Reinforcing Steel Institute.
7. NRMCA – National Ready Mix Concrete Association.
8. PCA – Portland Cement Association.
9. SWRI – Sealant, Waterproofing & Restoration Institute.
10. IBC – International Building Code.
11. Standard Specifications – Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS, latest edition.
12. CBC – California Building Code, Title 24 Disabled Access Regulations.

B. Definitions:
1. Cementitious Materials: Portland Cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.
2. Percent Compaction: Per ASTM D1557, percentage of the maximum in-place dry density of the same material, as determined by Geotechnical Engineer.

C. Standards of Construction:
1. ACI 214 – Recommended Practice for Evaluation of Strength Tests Results of Concrete.
2. ACI 301 – Details and Detailing of Concrete Reinforcement.
3. ACI 303.1 – Standard Specification for Cast-in-Place Architectural Concrete.
4. ACI 304 – Recommended Practices for Measuring, Mixing, Transporting, and Placing of Concrete.
5. ACI 305 – Recommended Practices for Cold Weather Concreting.
6. ACI 306 – Recommended Practices for Hot Weather Concreting.
7. ACI 308 – Standard Practice for Curing Concrete.
8. ACI 347 – Recommended Practice for Concrete Formwork.
9. ASTM A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
10. ASTM A615 – Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
11. ASTM C33 – Standard Specification for Concrete Aggregates.
12. ASTM C39 – Test Method for Compressive Strength of Cylindrical Concrete Specimens.
13. ASTM C94 – Standard Specification for Ready-Mix Concrete.
14. ASTM C136 – Method for Sieve Analysis of Fine and Coarse Aggregate.
15. ASTM C143 – Test Method for Slump of Portland Concrete Cement.
16. ASTM C150 – Standard Specification for Portland Cement.
17. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
18. ASTM C309 – Liquid Membrane-Forming Compounds for Curing Concrete.
19. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
20. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.

21. ASTM C979 – Standard Specification for Pigments for Integrally Colored Concrete.
22. ASTM D1751 – Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-Extruding and Resilient Bituminous Types).
23. National Ready Mix Concrete Association, latest revision: "Certificate of Conformance for Concrete Production Facilities".

D. Measurements:
1. PSI: Measurement, in pounds per square inch.
2. CU/FT: Measurement, in cubic-foot.

3. SUBMITTALS

A. General:
1. Collect information into a single Submittal for each element of construction and type of product or equipment identified under this Section for review.
2. To expedite review, Submittal shall be organized and presented into specific sections or headings. Furnish neat, concise, legible, and clearly identifiable information, and sufficiently explicit detail, to enable proper evaluation for Contract compliance. Highlight catalog, product data, or brochures containing various products, sizes, and materials to show particular item submitted.
3. Submittal Format: As applicable, furnish Submittal as a single electronic digital PDF (Portable Document Format) file.

B. Digital Submittal Information:
1. Product/Material Data: Submit available product/material literature supplied by manufacturer's, indicating that their products comply with specified requirements. Provide manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of product/material:
   a. Reinforcement and Forming Accessories.
   b. Cementitious Materials.
   c. Integral Aggregates (Coarse and Fine).
   d. Chemical Admixtures.
   e. Jointing Materials and Systems, including Joint Sealants.
   f. Curing Compounds.
   g. Finishing Materials (surface retarders, etc.)
   h. Paving Surface Sealants.
2. Statement of Mix Design: Prepared by the batch plant servicing the Project, submit for each type or load delivered to Project. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Each Statement of Mix Design shall include the following:
   a. Name, address, and telephone number of batch plant preparing Statement of Mix Design.

SECTION 321373
CONCRETE PAVEMENT JOINT SEALANTS

1.1 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.

B. Multicomponent Jet-Fuel-Resistant Sealant for Concrete: Pourable, chemically curing elastomeric formulation complying with the following requirements for formulation and with ASTM C 920 for type, grade, class, and uses indicated:

1. Urethane Formulation: Type M; Grade P; Class 12-1/2; Uses T, M, and, as applicable to joint substrates indicated, O.
2. Coal-Tar-Modified Polymer Formulation: Type M; Grade P; Class 25; Uses T and, as applicable to joint substrates indicated, O.
3. Bitumen-Modified Urethane Formulation: Type M; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.

C. Single-Component Jet-Fuel-Resistant Urethane Sealant for Concrete: Single-component, pourable, coal-tar-modified, urethane formulation complying with ASTM C 920 for Type S; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.

D. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.

E. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral- curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

F. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self- leveling sealant.

G. Available Products: Subject to compliance with requirements, cold-applied joint sealants that may be incorporated into the Work include, but are not limited to, the following:

1.2 HOT-APPLIED JOINT SEALANTS

A. Jet-Fuel-Resistant Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3569.

1.3 PRIMERS

A. 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.

END OF SECTION

SECTION 321513
STABILIZED DECOMPOSED GRANITE PAVING

1.GENERAL

1. SUMMARY

A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required, to make a complete, universally-accessible, stabilized Decomposed Granite Paving Application on a prepared sub-grade, as shown in the Contract Drawings, and as specified herein this Section.

B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
   1. Decomposed Granite Material.
   2. Organic Binder (Stabilizer), where applicable in paving locations.
   3. Accessories (Soil Sterliant (Herbicide)).

C. Related Sections: The following Sections contain requirements that relate to Work in this Section:
   1. Section 312219 – Landscape Grading.
   2. Section 3284 00 – Irrigation Systems.
   3. Section 329113 – Soil Preparation.
   4. Section 329400 – Landscape Planting Accessories (Geotextile Filter Fabric; Steel Edging/Concrete Header, Soil Sterliant (Herbicide), etc.
   5. Section 329813 – Landscape Establishment Period.

2. DEFINITIONS AND APPLICABLE STANDARDS

A. References:
   1. ASTM – American Society for Testing and Materials.
   2. AASHTO – American Association of State Highway and Transportation Officials.
   3. ADAAG – American with Disabilities Act Accessibility Guidelines.
   4. CBC – California Building Code, Title 24 Disabled Access Regulations.

B. Definitions:
   1. Percent Compaction: Per ASTM D1557, percentage of the maximum in-place dry density of the same material, as determined by the Geotechnical Engineer.
   2. Stabilized Decomposed Granite Paving: Shall consist of a thoroughly pre-blended mixture (before placement) of Decomposed Granite material (fines) and Organic Binder (“Stabilizer”), that is set in lifts, reacted with water, and compacted in place, creating a universally-accessible finished surface of Stabilized Decomposed Granite Paving.

C. Standards for Installation:
   1. Standard Specifications: Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation (CALTRANS).

3. SUBMITTALS

A. General:
1. Collect information into a single Submittal for each element of construction and type of product or equipment identified under this Section for review.
2. To expedite review, Submittal shall be organized and presented into specific sections or headings. Furnish neat, concise, legible, and clearly identifiable information, and sufficiently explicit detail, to enable proper evaluation for Contract compliance. Highlight catalog, product data, or brochures containing various products, sizes, and materials to show particular item submitted.
3. Submittal Format: As applicable, furnish Submittal as a single electronic digital PDF (Portable Document Format) file.

B. Digital Submittal Information:
1. Product/Material Data: Submit available product/material literature supplied by manufacturer's, indicating that their products comply with specified requirements, technical data, and tested physical and performance properties. Provide manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of product/material:
   a. Decomposed Granite Material.
   b. Organic Binder.
   c. Soil Sterilant (Herbicide).
2. Supplemental Data:
   a. Sieve Analysis: Submit Sieve Analysis of each type of Decomposed Granite material to ensure it meets proper grading requirements.
   b. Material Test Reports: Submit certified copies of the field tests performed (testing the compressive strengths) of the Stabilized Decomposed Granite Paving finished surface.
   c. Recommendation: Submit written recommendation from the Manufacturer/Distributor of the Organic Binder, indicating the quantity (pounds) of Organic Binder required per ton of Decomposed Granite material (lbs./ton). Recommendation shall be specific to each type of Stabilized Decomposed Granite material specified herein.
3. Qualification Data: Submit names for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience on similar Decomposed Granite installations.

C. Material Samples: Submit four (4) sets of physical Material Samples for review of kind, color, pattern, size, 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. Include the full range of exposed color and texture expected in the completed Work. Provide Material Samples bound and individually wrapped in re-sealable labeled 1-gallon plastic bags (as applicable):
1. Submit sample in sufficient quantity (one (1) pound minimum, per bag) of each Decomposed Granite material for review to ensure color will be compatible with the Project.

D. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.

E. No Work shall proceed under this Section until Submittal requirements indicated herein have been reviewed accordingly by the Landscape Architect.

4. QUALITY ASSURANCE AND CONTROL

A. Installer Qualifications:
   1. Requirement: Valid California C-27 (Landscaping Contractor) License.
   2. Engage an experienced Installer who has completed in the last two (2) years at least three (3) Stabilized Decomposed Granite Paving installations similar in material, design, and extent to that indicated for this Project, and whose work has resulted in construction with a record of successful in-service performance.
   3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that installations under this Section are in progress.

B. Source Limitations: Obtain each type of Stabilized Decomposed Granite material from the same Manufacturer's plant.

C. Single-Source Responsibility: Obtain each color, type, and/or variety of Stabilized Decomposed Granite material from a single source with resources to provide products and materials of consistent quality in appearance and physical properties without delaying the Work.

D. Manufacturer’s Directions: Follow Manufacturer’s directions and drawings in cases where the Manufacturers of articles used in this Section furnish directions covering points not shown in the Contract Drawings and Contract Specifications.

E. Field-Constructed Mock-ups: Prior to the installation of Work under this Section, Contractor shall erect Field-Constructed Mock-ups for each type of Stabilized Decomposed Granite Paving application to verify selections made under this Article and to demonstrate aesthetic effects as well as qualities of materials and execution. Build Field-Constructed Mock-ups to comply with the following requirements, using materials and same base construction including special features for surface finish, compaction within lifts, color(s), and contiguous work, as indicated for the final unit of Work.
   1. Locate Field-Constructed Mock-ups in a location and of the size indicated or, if not indicated, as directed by the Owner’s Representative.
   2. Notify the Landscape Architect, in writing, at least one (1) week in advance of the dates and times when Field-Constructed Mock-ups will be erected.
   3. Demonstrate quality and range of aesthetic effects and workmanship in the Field-Constructed Mock-ups that will be produced in the final unit of Work.
   4. Obtain the Landscape Architect’s acceptance of the Field-Constructed Mock-ups, in writing, before the start of Work. Accepted Mock-ups are a prerequisite to commencing Work under this Section.

5. Retain and maintain Field-Constructed Mock-ups during construction in an undisturbed condition. Accepted Field-Constructed Mock-ups shall be the standard for judging the completed Work under this Section.
   a. When directed by the Landscape Architect, Contractor shall demolish and remove Field-Constructed Mock-up Samples from the Project Site.
6. Contractor shall provide a separate Field Constructed Mock-up for each type of Stabilized Decomposed Granite Paving application for review by the Landscape Architect.
   a. Each Field-Constructed Mock-up shall measure four-feet (4') wide and six-feet (6') long, and at the specified respective depths of Decomposed Granite indicated in the Contract Drawings, to compare the aesthetics of material colors, textures, and finishes. Include the specified header/edging material around the perimeter of the Mock-up.
      1) When the Landscape Architect determines that a Field-Constructed Mock-up does not meet requirements, retain it for reference and create another Field-Constructed Mock-up until the Field-Constructed Mock-up is accepted by the Landscape Architect.
7. Accepted Field-Constructed Mock-up(s) will be the standard by which remaining Work will be evaluated for technical and aesthetic merit, and re a prerequisite to commencing any Work under this Section.

5. DELIVERY, STORAGE, AND HANDLING

A. Protect Stabilized Decomposed Granite Paving material from contamination with foreign materials. Isolate stockpiles to prevent mixing of different aggregate grades prevent contamination with organic materials.

B. Deliver perishable material in original, unopened packaging. Protect from dampness.

C. Deliver and install Decomposed Granite materials so as to not delay Work, and install only after preparations for installation have been completed.

6. COORDINATION, SCHEDULING, AND OBSERVATIONS

A. Notify the Contractors performing Work related to installation of Work under this Section in ample time so as to allow sufficient time for them to perform their portion of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section. Coordinate items of other trades to be furnished and set in place.

B. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

C. Excavation: When conditions detrimental to installing Stabilized Decomposed Granite Paving is encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease installation operations and notify Landscape Architect for further direction.

D. Traffic Control: Maintain access for vehicular, bicycle, and pedestrian traffic as required for other construction activities during installation of Stabilized Decomposed Granite Paving. Access shall also be unobstructed and maintained at all times to allow for entry and exit of emergency vehicles.

E. Grades and Levels: Establish and maintain required levels and grade elevations. Review installation procedures and coordinate Work herein this Section with other Work affected.

F. Installation: Perform installation of Stabilized Decomposed Granite Paving only when weather and soil conditions during rain or while sub base is wet from rain. Do not apply Soil Sterilant when winds exceed 10 mph or during or immediately after rain.

G. Sequence and Scheduling: Do not install Work under this Section prior to acceptance of sub-grade preparation Work under another Section. Install edging/header materials prior to placement of Stabilized Decomposed Granite Paving, where applicable. Coordinate with other trades to insure proper placement of irrigation sleeves (per Section 328400) prior to installation of Decomposed Granite.

H. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective Work under this Section at any time during progress of Work. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

7. SUBSTITUTIONS

A. Consideration: Stabilized Decomposed Granite Paving materials to be considered equal to the Stabilized Decomposed Granite Paving materials indicated herein this Section shall be reviewed by the Landscape Architect. Materials with equal performance characteristics produced by other Manufacturer's and/or Distributors may be considered, providing deviations in dimensional size, color, composition, operation, and/or other characteristics do not change the design concept, aesthetic appearance, nor intended performance, as solely judged by the Landscape Architect. The burden of proof on product equality is on the Contractor.

B. Specific reference to Manufacturer's names and products specified herein are used as standards of quality. This implies no right to the Contractor to substitute other materials without prior written approval by the Landscape Architect for Work under this Section.

C. Stabilized Decomposed Granite Paving material(s) substituted and installed by the Contractor, without prior written approval by the Landscape Architect, may be rejected. Contractor shall not be entitled to be compensated by the Owner where the Contractor has installed rejected substitutions without receiving prior written approval.

D. Contract Price: Substituted Stabilized Decomposed Granite Paving material(s) shall not increase the Contract price.

8. LANDSCAPE ESTABLISHMENT PERIOD

A. Refer to Section 329813 – Landscape Establishment Period, for requirements under this Article.
   1. During the duration of the Landscape Establishment Period, continuously maintain Stabilized Decomposed Granite Paving finishes until Final Acceptance of Work is granted. Immediately repair damage to the Work as the result of weather or traffic conditions. Report damage resulting from Work of other trades after installation of Stabilized Decomposed Granite Paving Work. Repair to match adjacent undisturbed Work.

2.PRODUCTS

1. DECOMPOSED GRANITE MATERIAL

A. Clean, hard, durable particles or fragmented fines of select crushed granite, river rock, or basalt. Material fines shall be evenly mixed throughout the aggregate. When produced from gravel, fifty percent (50%) by weight of the material retained on a No. 4 sieve shall have one (1) fractured face.

B. The portion retained on the No. 4 sieve shall have a maximum percentage of wear of 50 at 500 revolutions as determined by AASHTO T96-77.

C. Portion passing a No. 4 sieve shall have a maximum liquid limit of 25 and a maximum plasticity index of 7, as determined by AASHTO T89-81 and AASHTO 90-81 respectively.

D. Composition: Decomposed Granite material shall be free from clay lumps, vegetable matter, or deleterious material.

E. Grading Requirements:

Percentage of Weight Passing a Square Mesh Sieve (AASHTO T11-82 and T27-82)	
Sieve Size	Percent Passing
3/8”	100%
No. 4	95 – 100%
No. 8	75 – 80%
No.16	55 – 65%
No. 30	40 – 50%
No. 50	25 – 35%

No. 100	20 – 25%
No. 200	5 – 15%

F. Products & Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Stabilized Decomposed Granite Paving:
      a. Type: Refer to the Contract Drawings.
      b. Supplier: Southwest Boulder and Stone, Fallbrook, CA, ph. 877.792.7625
      c. Or equal, as approved by the Landscape Architect.

2. ORGANIC BINDER

A. Organic Binder: Non-toxic, colorless, odorless, non-staining, concentrated organic powder that, when water is applied and then compressed, binds the Decomposed Granite material together, creating a natural-appearing, firm surface of Stabilized Decomposed Granite Paving.
   1. Products & Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Material: *Stabilizer*®, Stabilizer Solutions, Inc., Phoenix, AZ.
         1) Supplier:
            a) Southwest Boulder & Stone, Fallbrook, CA, ph. 877.792.7625.
            b) Or equal, as approved by the Landscape Architect.
         2) Application Rate: Per Manufacturer's written recommendations. Minimum application rate of 12 lbs./ton.
      b. Material: *Natracil*™ Organic Binder.
         1) Supplier:
            a) Gail Materials, Corona, CA, 951-279-1095.
            b) Or equal, as approved by the Landscape Architect.
         2) Application Rate: Per Manufacturer's written recommendations. Minimum application rate of 12 lbs./ton.

3. EQUIPMENT

A. Mixing Equipment: Batch-type, using revolving blades or rotary drum.

B. Compaction Equipment: Power roller, weighing not less than five (5) tons.

4. ACCESSORIES

A. Soil Sterilant: Spray-applied, Non-Selective Post-Emergent Herbicide, for control of annual grasses and broadleaf weeds. Refer to Section 329400 – Landscape Planting

Accessories. Apply in locations designated to receive Stabilized Decomposed Granite Paving only.

B. Aggregate Sub-Base: Class II, per "Standard Specifications", as required.

C. Water: Per ASTM C 94, from potable domestic source, and free from deleterious materials such as oils, acids, and organic matter. Transport as required.

D. Edging/Header Materials: Refer to Section 329400 – Landscape Planting Accessories.

E. Geotextile Filter Fabric: Refer to Section 329400 – Landscape Planting Accessories.

3.EXECUTION

1. EXAMINATION

A. Examine surfaces indicated to receive Stabilized Decomposed Granite Paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of surfacing.

B. Sub-grades shall have been rough graded to within 0.10 ft. of finish grades less depth in location to receive Stabilized Decomposed Granite Paving.

C. Insure edging materials and irrigation sleeving have been installed and are in place and secured. Do not proceed with installation Work until unsatisfactory conditions have been corrected.

2. PREPARATION

A. Application of Soil Sterilant:
   1. Mixing: Mix Soil Sterilant product in sprayer tank with clean water, according to Manufacturer's current printed instructions. Use sprayer, which will apply the solution uniformly, without disturbing the soil.
   2. Spray Solution: Shake or stir prior to each application. Apply to dry soil surface only.
   3. Application: Provide Soil Sterilant only in locations designated to receive Stabilized Decomposed Granite Paving, as indicated on the Contract Drawings.
   4. Over-spraying: Avoid spraying on walls, adjoining pavements, and all areas to receive landscape planting.
   5. Depth: Immediately after application of spray solution, thoroughly incorporate the solution into the soil to a depth of two-inches (2") to four-inches (4"), per Manufacturer's current printed instructions.

B. Compaction: After completion of soil sterilization operations, compact sub-base to minimum 90% compaction, or as recommended by the Geotechnical Engineer.

3. INSTALLATION

A. Installing Edging/Headers: Install Edgings/Headers, as indicated on the Contract Drawings. Refer to Section 329400 – Landscape Planting Accessories for requirements. Edgings/Headers at the full depth of the perimeter of the Stabilized Decomposed Granite Paving, as indicated. Edgings/Headers shall be straight or curving as required, and securely in place, true to line and grade as required. Align header edges and set flush with adjacent paving where applicable.

B. Installing Geo-textile Filter Fabric: Geo-textile Filter Fabric shall be installed only in locations designated to receive Stabilized Decomposed Granite Paving. Install Fabric accordingly as indicated in the Contract Drawings to prevent weeds from growing up through the Stabilized Decomposed Granite Paving. Place the Geotextile Filter Fabric across the entire width of the Paving surface; overlap ends of Fabric rolls at a minimum of six inches (6").

C. Installing Aggregate Sub-Base (as applicable):
   1. Verification: Do not place Aggregate Sub-Base prior to acceptance of sub grade preparation.
   2. Placement: Spread Aggregate Sub-Base to thicknesses shown on the Contract Drawings and compact to a minimum of ninety-percent (90%) compaction, or as recommended by the Geotechnical Engineer.

D. Installing Stabilized Decomposed Granite Paving:
   1. Verification: Verify locations to receive Stabilized Decomposed Granite Paving.
   2. Lines and Levels:
      a. Install Stabilized Decomposed Granite Paving true to grade, properly coinciding with adjacent Work and elevations.
      b. Provide a finished Stabilized Decomposed Granite Paving surface uniform in texture and appearance. Do not permit finished Work to vary more than 1/8 inch in 10 feet from true profile and cross section. Finished Work shall be installed to fully comply as a universally-accessible pavement surface, per applicable Code requirements.
   3. Mixing:
      a. General: Stabilized Decomposed Granite Paving shall be thoroughly pre-blended before placement.
      b. Organic Binder: Thoroughly pre-blend Decomposed Granite material with Organic Binder at the rate recommended by the Organic Binder manufacturer for each type of Decomposed Granite material specified, but not less than of twelve (12) pounds of Organic Binder per one (1) ton of Decomposed Granite material (dry weight).
         1) It is essential the Organic Binder be thoroughly mixed, blended, and uniformly incorporated throughout the Decomposed Granite material to achieve a successful result. The Organic Binder locks the fines in the Decomposed Granite material together, trapping the larger crushed aggregate screenings. The Organic Binder does not act directly on larger aggregate screenings. Proper mixing is a must for a successful application.

a) Blending is best accomplished in a plug mill; a truck mounted mixer or a portable mechanical mixer may also be used.
b) Blend Stabilized Decomposed Granite Paving mixture for a minimum of 15 minutes prior to placing on compacted sub-surface material.
c) Drop spreading of Organic Binder over graded Decomposed Granite material is not acceptable. Mixing by roto-tilling is also not acceptable.
d) Organic Binder shall not be applied during, just prior to, or immediately following rainfall.

4. Placement:
   a. General: After pre-blending, place the Stabilized Decomposed Granite Paving material onto the compacted sub-surface material. Carefully place to avoid segregation in two (2) equal two-inch (2") lifts.
   b. Grade, screed, and smooth the Stabilized Decomposed Granite Paving to desired finish grades. Allow for compaction of the material.
5. Watering: Apply water until moisture penetrates to the full depth of the Stabilized Decomposed Granite Paving.
   a. Water activates the Organic Binder; it is essential that the full depth of the Stabilized Decomposed Granite Paving is saturated at this time. Apply water from a hand held hose with a spray nozzle set to coarse spray. Water pressure should not disturb the leveled Paving surface. Do not use a water truck for water distribution or a high-pressure sprayer.
      1) Test for water penetration through random core inspections. After inspection of cores, fill cored holes with Paving removed; smooth and hand tamp to match adjoining surface grades.
      2) A one (1)-hour application at a rate of +/-20 GPM per 1,000 sq. ft. of surface seems to achieve the desired full depth moisture penetration.
      3) Let watered Stabilized Decomposed Granite Paving stand between six (6) to twenty-four (24) hours until all surface water has dissipated; the Paving surface should be moist, but not wet.
6. Compacting: While the Stabilized Decomposed Granite Paving material is still thoroughly moist, compact to a minimum 90% relative compaction, or as recommended by the Geotechnical Engineer. Compact each area with at least four (4) passes of the compacting equipment. After compacting, screed smooth.
   a. Compaction should be done with a heavy lawn roller (minimum 225 pounds and maximum 30-inch width) to achieve finish grade and initial compaction. Hand-tamp edges around benches, signposts, trash receptacles, etc. Use a heavy (1-ton minimum) small rider, after having used the lawn roller, to obtain the desired final dense, smooth uniform texture. Do not use whackers, vibratory rollers or a vibrating plate tamper; the Stabilized Decomposed Granite Paving will not harden for weeks after vibration.
      1) If the Decomposed Granite Paving surface is flaky or sticks to the roller drum, the Paving hydration level is deficient; cautiously add more water as required to achieve the Paving's proper hydration level.
      2) If the roller creates a wash board effect or rills, additional time is required to allow the Paving to achieve the proper hydration level.

7. Contaminated Areas: Do not permit Stabilized Decomposed Granite Paving to contaminate adjoining planting areas or finishes. Clean up and remove all material spilled into adjacent planting areas.
8. Grading: When surface areas have been rolled and it becomes necessary to add a thin layer of Stabilized Decomposed Granite Paving material to bring the surface to grade, the previously rolled or compacted area shall be thoroughly scarified to a depth of two-inches (2") to provide a bond with the added Material.
9. Curing: Allow finished Stabilized Decomposed Granite Paving surface to dry completely. Set-up time varies, depending on weather conditions.
   a. A hot, dry climate will set up sooner than a cool, moist climate.

4. FIELD QUALITY CONTROL

A. Tests: For each lift of Stabilized Decomposed Granite Paving, provide written verification as to the degree of compaction by a certified testing laboratory. Re-compact failed areas until specified compaction is achieved.

B. Testing shall be the sole financial responsibility of the Contractor.

5. REVIEW OF COMPLETED INSTALLATION

A. Finished Stabilized Decomposed Granite Paving surfaces shall be smooth, uniform and solid, with no evidence of shipping or cracking. Dried, compacted material shall be firm through the entire depth, with no spongy areas. Loose material shall not be present on the surface initially. After the first year of use, a minor amount of loose material is expected on the surface of Stabilized Decomposed Granite Paving finishes.

B. Loose Decomposed Granite material on the surface or unconsolidated crushed aggregate screenings below the surface of Stabilized Decomposed Granite Paving finishes is evidence of improper bonding due to poor mixing or insufficient watering. Test the loose material for adequate Organic Binder by wetting, then tamping, and allowing it to dry. If the material still is unconsolidated, the Organic Binder did not get mixed adequately throughout the Stabilized Decomposed Granite Paving material. If the material now is solid, initial watering was insufficient. Cracking or sponginess is evidence of excessive Organic Binder in the mix.

C. Unconsolidated Paving areas shall be excavated and replaced accordingly with new Stabilized Decomposed Granite Paving material with a high proportion of fines meeting the grading requirements above, and pre-blended with Organic Binder per the procedures listed above. Patched areas shall be wetted thoroughly and rolled smooth. Patching shall be completed prior to any surface smoothing.

D. Smoothing of Stabilized Decomposed Granite Paving: Significant irregularities shall be smoothed out prior to final acceptance of Work. Smoothing shall be accomplished by rewetting/saturating rough areas thoroughly, and then rolling the material again with a heavy roller (1,000–1,500 lb. powered walk-behind roller, or small rider). Whackers are not recommended.

E. Tolerances of Stabilized Decomposed Granite Paving:
   1. Depth: Final thickness of completed Stabilized Decomposed Granite Paving shall not vary more than 1/4-inch from dimension indicated in the Contract Drawings. Measurements may be taken by means of test holes taken at random, finished surfaces. Correct any variations in the thickness beyond the allowable ½ inch by repeating the procedures listed above.

F. Width: Final width of completed Stabilized Decomposed Granite Paving shall not vary more than ½ inch from typical dimension width as indicated. Measurements may be taken at random cross sections along the finished surface.

G. Where installed, no edges of the Geotextile Filter Fabric shall be exposed.

6. REPAIRS AND PROTECTION

A. Damage or Defective Installation: Remove and replace Stabilized Decomposed Granite Paving that is damaged or defective, or does not meet the requirements indicated herein this Section.

B. Replacement of Stabilized Decomposed Granite Paving: If compression tests of cored samples fail to meet the specified compressive strengths as recommended by the Manufacturer, immediately remove and replace the Stabilized Decomposed Granite Paving with material conforming to the Contract Specifications.

C. Protection: Protect Stabilized Decomposed Granite Paving against traffic, injury, defacement or damage (by rain or other outside force during curing period) and subsequent construction operations until Substantial Completion. Exclude traffic from Stabilized Decomposed Granite Paving for a minimum of fourteen (14) days after placement. When construction traffic is permitted, it is the Contractor's responsibility to maintain Stabilized Decomposed Granite Paving as clean and level as possible by removing surface stains, spillage of materials as they occur, and traffic markings/grooves, etc., and to repair any damaged caused by said construction traffic.

D. Maintain Stabilized Decomposed Granite Paving finishes free of stains, discoloration, dirt, and other foreign material until Final Acceptance of Work.

7. CLEAN UP AND PROTECTION

A. For Work under this Section, keep Work area in a clean, orderly, and safe condition. Contractor shall remove trash caused from his Work on a weekly basis throughout the duration of the Work.

B. Protect Stabilized Decomposed Granite Paving from damage due to landscape operations, operations by other Contractors and trades, and trespassers. Maintain protection during installation and maintenance periods.

C. Upon completion of his Work under this Section, the Contractor shall remove rubbish, waste, debris, excess construction materials, and other items resulting from construction operations offsite as described herein this Section and directed by the Landscape Architect. Clean all adjoining pavements, edgings/headers free from excess Stabilized Decomposed Granite Paving material.

8. FINAL REVIEW

A. Final Review under this Section shall be performed upon completion of the Landscape Establishment Period. Refer to Section 329813 – Landscape Establishment Period, for requirements.

END OF SECTION

SECTION 321723

PAINTED PAVING MARKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes surface preparation and field application of pavement marking on hot-mix asphalt paving and portland cement concrete paving.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: For each product specified. Include technical data and tested physical and performance properties. Provide recommended dry film and wet film thickness for each paint product type.

C. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate dedicated handicapped spaces with international graphics symbol.

D. Product certificates signed by manufacturers certifying that their products comply with the specified requirements.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of pavement marking material from one source and by a single manufacturer.

B. Installer Qualifications: Engage an experienced installer who has completed pavement marking similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a covered, clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

A. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4 deg C) for oil-based materials, 50 deg F (10 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products specifically formulated for pavement marking by one of the following or approved equal:
   1. Dunn-Edwards Paints (Dunn-Edwards).
   2. Sinclair Paint (Sinclair).
   3. Sherwin Williams.

2.2 PAVEMENT MARKING MATERIALS

A. Pavement-Marking Paint: Alkyd-resin type, ready-mixed, complying with FS TT-P-115, Type I, or AASHTO M-248, Type N, and suitable for use on both hot-mix asphalt and portland cement concrete paving.

B. Pavement-Marking Paint: Latex, water-base emulsion, ready-mixed, complying with FS TT-P-1952, and suitable for use on both hot-mix asphalt and portland cement

concrete paving. Provide material having a volatile organic compound (VOC) content of 250 g/L, or less.

C. Pavement-Marking Paint: Epoxy fortified vinyl/acrylic or acrylic-emulsion water-based traffic paint suitable for use on both hot-mix asphalt and portland cement concrete paving. Provide material having a volatile organic compound (VOC) content of 250 g/L, or less.
   1. Colors:
      a. As indicated.
      b. Color: White (for all parking stalls other than handicapped parking, and for traffic and lane marking).
      c. Color: Yellow.
      d. Color: Red (for "No Parking" areas as shown).
      e. Color: Blue equal to Color No. 15090 per Federal Standard 595 B (for pavement markings identifying disabled parking spaces).
   2. Gloss: Flat.
   3. Products: Subject to compliance with requirements, provide one of the following or approved equal:
      a. Dunn-Edwards: Vin-L-Stripe W 801 Series.
      b. Sinclair: Traffic Paint 160 (white), 161 (red), 162 (yellow), and 166 (blue).
      c. Sherman Williams: Setfast Latex Traffic Marking Paints and Setfast Acrylic Waterborne Traffic Marking Paint.
      d. Sherman Williams: Setfast Quick Dry Latex Traffic Paint.

D. Glass Beads: AASHTO M-247 or California State Specification 8010-71L-22.

E. Surface Cleaning Material: Cleaning agent or agents suitable for removing grease, oil, and other contaminants that will not damage asphalt or portland cement concrete paving and are acceptable to pavement marking paint manufacturer.

PART 3 - EXECUTION

3.1 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow paving to cure for a minimum of 30 days before starting pavement marking. Comply with recommendations of the pavement marking paint manufacturer for longer cure periods.

C. Sweep and clean surface to eliminate loose material and dust. Ensure all surfaces indicated to receive pavement marking are clean and free from grease, oil, concrete

sealers and curing agents, and other contaminants that might interfere with paint adhesion.

1. Comply with manufacturer's instructions for use of special cleaning agents.
2. For removal of substances that would interfere with paint adhesion use methods recommended by the paint manufacturer if applicable, or methods that will completely remove the substance without damaging or discoloring the underlying pavement substrate.

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 (0.4 mm).

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates based on substrate type and cure conditions. Do not exceed manufacturer's recommended application rates.

1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).

E. Comply with paint manufacturer's maximum drying time requirements before allowing traffic in order to prevent undue softening of bitumen and pick-up, displacement, or discoloration of pavement marking by vehicular traffic.

F. Paint pavement, curbs, and other surfaces as shown on the Drawings. Painting shall be straight, uniform, exact, and sharp without blobs at the start and finish. Edges shall be even, accurate, symmetrical, and free of fuzziness.

1. Edge Tolerance: 1/2 inch in 20 feet, maximum.

G. Apply markings for disabled access symbols in accordance with State of California Building Code, Part 2, Title 24, CCR. Painted lines and marking on pavement shall be 3” minimum wide. Parking spaces for the disabled shall be marked according to CBC Section 1129B.5. Tactile warning lines shall be in conformance to CBC Section 1133B.8.3 and 1133B.8.4.

H. Where work consists of modifications of, or additions to existing pavement marking, match existing color and line width.

3.2 ADJUSTING

A. Touch up pavement markings not complying with requirements of this Section by painting out the errors with permanently opaque paint of the same color as the substrate pavement.

1. Block out and eliminate all traces of splashed, tracked, and spilled pavement marking paint from the background surfaces.

2. Paint over deviations in marking edges exceeding allowable tolerance and apply new marking meeting specified requirements.

B. The Owner reserves the right to require sandblast removal of extensive defective pavement marking and application of new marking meeting specified requirements at no additional cost.

3.3 PROTECTION

A. Provide traffic cones, barricades, and other devices needed to protect the pavement marking until it is sufficiently dry to withstand traffic without damage.

END OF SECTION

SECTION 328400
LANDSCAPE IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY

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 indicated on the drawings, 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, 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.

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 engineering. 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 revision 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 furnish directions covering points not 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 at no additional cost to Owner.

E. The Contractor shall secure the required licenses and permits including payments of charges and fees, give required notices to public authorities, verify permits secured or arrangements made by others affecting the work of this section.

1.4 SUBMITTALS

A. Water Pressure Confirmation Letter:

1. After award of contract and before any irrigation system materials are ordered from suppliers or delivered to the job site, submit to the Owner a letter verifying that a dynamic water pressure test at the irrigation points of connection has been performed.

2. A dynamic water pressure test is performed to measure the water pressure at a point of connection with water in motion through the point of connection. Static water pressure testing, no water movement, shall not be acceptable.

3. The dynamic water pressure test shall be performed at the points of connection using the full flow volume (maximum demand) as indicated on the plans.

4. In the letter identify the water point of connections tested, the date of the test, time of the test, flow rate at which the test was performed and the measured dynamic water pressure in PSI.

5. If any discrepancies between the measured water pressure and the information shown on the plans are found, immediately notify the Landscape Architect and Irrigation Designer.

6. Failure to perform the dynamic water pressure test, or failure to report pressure discrepancies, shall place the full responsibility for all costs including

revisions to the design, irrigation equipment re-sizing, and additional equipment quantities on the Irrigation Contractor.

B. Submittals Materials List:

1. After award of contract and before any irrigation system materials are ordered from suppliers or delivered to the job site, submit to the Owner a complete list of all irrigation system materials, or processes proposed to be furnished and installed as part of this contract.

2. The submittals materials list shall include the following information:

a. A title sheet with the job name, the contractor's name, contractor's address and telephone number, submittal date and submittal number.

b. An index sheet showing the item number (i.e. 1,2,3, etc.); an item description (i.e. sprinkler head); the manufacturer's name (i.e. Rain Bird); the item model number (i.e. 8005-SS); and the page(s) in the submittal set that contain the catalog cuts.

c. The catalog cuts shall be one or two pages copied from the most recent manufacturer's catalog that indicate the product submitted. Do not submit parts lists, exploded diagrams, price lists or other extra information.

d. The catalog cuts shall clearly indicate the manufacturer's name and the item model number. The item model number, all specified options and specified sizes shall be circled on the catalog cuts.

e. Submittals for equipment indicated on the legend without manufacturer names, or "as approved", shall contain the manufacturer, Class or Schedule, ASTM numbers and/or other certifications as indicated in these specifications.

3. Submittal materials list format requirements:

a. Submittals shall be provided as one complete package for the project. Multiple partial submittals will not be reviewed.

b. Submittal package shall be stapled or bound in such a way as to allow for disassembly for review processing. Submittals shall not have tabs, tab sheets, spiral binding, or any other type of binding that will interfere with automated copying of submittals.

c. Submittal package shall have all pages numbered in the lower right hand corner. Page numbers shall correspond with submittal index.

d. Re-submitted packages must be revised to include only the equipment being re-submitted. Equipment previously reviewed and accepted shall

not be re-submitted in the materials list/index sheet or in the catalog cut sheet package.

C. Substitutions: If the Irrigation Contractor wishes to substitute any equipment or materials for those equipment or materials listed on the irrigation drawings and specifications, he may do so by providing the following information to the Landscape Architect or Owner's authorized representative for approval.

1. Provide a written statement indicating the reason for making the substitution.

2. Provide catalog cut sheets, technical data, and performance information for each substitute item.

3. Provide in writing the difference in installed price if the item is accepted.

D. The Landscape Architect or Owner's authorized representative will allow no substitutions without prior written acceptance.

E. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

F. The Landscape Architect or Owner's authorized representative will not review the submittal package unless provided in the format described above.
1.

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 water 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 septic tanks, 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 and Owner who will arrange for relocations. The 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 prior to paving operations.

F. The Contractor shall verify and be familiar with the existing irrigation systems in areas adjacent to and within the Project area of work.

G. The Contractor shall protect all existing irrigation systems, in areas adjacent to and within the project area of work, from damage due to his operations.

H. Contractor shall notify Owner's Representative if any existing system is temporarily shut off, capped or modified. Provide 48-hour notice, prior to turning off or modifying any existing irrigation system.

I. The Contractor shall repair or replace all existing irrigation systems, in areas adjacent to and within the project area of work, damaged by the construction of this project. Adjacent irrigation systems shall be made completely operational and provide complete coverage of the existing landscaped areas. All repairs shall be complete to the satisfaction of the Owner's Representative.

J. The contractor shall provide bore holes under any existing pavement or paving encountered for the required lateral, mainline and low voltage control wire sleeving. Bore holes under 2 inches in diameter and smaller shall be made. Bore holes larger than 2 inches in diameter shall be made with an approved mechanical boring tool. No air jacking or hydraulic boring of any kind shall be allowed.

1.6 INSPECTIONS

A. The Contractor shall permit the Landscape Architect and Owner's authorized representative to visit and inspect at all times any part of the work and shall provide 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 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 Contractor's expense.

C. Inspections will be required for the following at a minimum:

1. Pre-construction meeting.

2. System layout.

3. Pressure test of irrigation mainline (Four hours at 125 PSI or 120% of static water pressure, whichever is greater.) Mainline pressure loss during test shall not exceed 2 PSI.

4. Coverage test of irrigation system. Test shall be performed prior to any planting.

5. Final inspection prior to start of maintenance period.

6. Final acceptance prior to turnover.

D. Site observations and testing will not commence without the field record drawings as prepared by the Irrigation Contractor. Record drawings must be complete and up to date for each site visit.

E. Work that fails testing and is not accepted will be retested. Hourly rates and expenses of the Landscape Architect, Owner's authorized representative, and governing agencies for re-inspection or retesting will be paid by the Irrigation Contractor at no additional expense to Owner.

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 and at no additional cost to the 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 drawings all changes in the work constituting departures from the original contract drawings and the actual final installed locations of all required components as shown below.

2. The record drawings shall be prepared to the satisfaction of the Owner. Prior to final inspection of work, submit record drawings to the Landscape Architect or Owner's authorized representative.

3. All record drawings shall be prepared using AutoCAD drafting software and the original irrigation drawings as a base. No manual drafted record drawings shall be acceptable. The Contractor may obtain digital base files from the Landscape Architect or Owner's authorized representative.

4. If the Contractor is unable to provide the AutoCAD drafting necessary for the record drawings the irrigation designer does provide record drawing drafting as a separate service.

5. Prior to final inspection of work, submit record drawings for review by the Landscape Architect or Owner's authorized representative. The Contractor shall also provide record drawing information on a digital AutoCAD drawing file. All digital files shall be provided and clearly marked with the project name, file descriptions and date.

    a. Record drawing information and dimensions shall be collected on a day-to-day basis during the installation of the pressure mainline to fully indicate all routing locations and pipe depths. Locations for all other irrigation equipment shall be collected prior to the final inspection of the work.

    b. Two dimensions from two permanent points of reference such as buildings, sidewalks, curbs, streetlights, hydrants, etc. shall be shown for each piece of irrigation equipment shown below. Where multiple components are installed with no reasonable reference point between the components, dimensioning may be made to the irrigation equipment. All irrigation symbols shall be clearly shown matching the irrigation legend for the drawings. All lettering on the record drawings shall be minimum 1/8 inch in size.

6. Show locations and depths of the following items:

    a. Point of connection (including water POC, backflow devices, master control valves, flow sensors, etc.)

    b. Routing of sprinkler pressure main lines (dimensions shown at a maximum of 100 feet along routing)

    c. Isolation valves

    d. Automatic remote control valves (indicate station number and size)

    e. Quick coupling valves

    f. Drip flush valves / operation indicators

g. Routing of control wires where separate from irrigation mainline

h. Irrigation controllers (indicate controller number and station count)

i. Related equipment (as may be directed)

B. Controller Charts:

1. Provide one controller chart for each automatic controller. Chart shall show the area covered by the particular controller. The areas covered by the individual control valves shall be indicated using colored highlighter pens. A minimum of six individual colors shall be used for the controller chart unless less than six control valves are indicated.

2. Landscape Architect or Owner's authorized representative must approve record drawings before controller charts are prepared.

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.

4. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils in thickness.

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:

3. Index sheet stating Contractor's address and telephone number, duration of guarantee period, list of equipment including names and addresses of local manufacturer representatives.

a. Operating and maintenance instructions for all equipment.

b. Spare parts lists and related manufacturer information for all equipment.

D. Equipment:

1. Supply as a part of this contract the following items:

a. 100’ of the specified drip line tubing.

b. Two (2) keys for each automatic controller.

c. One (1) quick coupler key with a 3/4" bronze hose bib, bent nose type with hand wheel and two (2) coupler lid keys.

d. One (1) valve box cover key or wrench.

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. Punch list to be checked off by contractor and submitted to Landscape Architect or Owner's authorized representative prior to any follow-up meeting. This checked off list to indicate that all punch list items have been completed. At the time of the post-maintenance period or final inspection the work will be re-inspected 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 to the Owner's satisfaction by the Contractor without any additional expense to the Owner. 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.

B. 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 constitute 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 improvement resulting either from faulty materials or workmanship, or from the necessary repairs to correct same, shall be

repaired to the satisfaction of the Owner by the Contractor, all at no additional cost to the Owner.

C. Guarantee shall be submitted on Contractors 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 our 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 - MATERIALS

2.1 SUMMARY

A. 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 PIPE

A. Pressure supply lines 1 1/2 inches in diameter and smaller, as used in control valve assemblies only, shall be Schedule 40 solvent weld PVC conforming to ASTM D1785.

B. Non-pressure lines 3/4 inch in diameter and larger downstream of the remote control valve shall be SCH 40 solvent weld PVC conforming to ASTM D1785.

C. Sleeve lines 2 inches in diameter and larger shall be SCH 40 solvent weld PVC conforming to ASTM D1785.

2.3 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 ASTM D2672, ASTM D2241 or ASTM D1785.

C. All solvent weld PVC fittings shall be standard weight Schedule 40 (and Schedule 80 where specified on the irrigation detail sheet, all mainline fittings shall be Schedule 80 PVC) 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 D2464 and ASTM D2466.

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.

2.4 VALVES

A. Ball Valves:

1. Ball valves shall be of the manufacturer, size, and type indicated on the drawings.

2. Ball valves for mainline isolation shall be slow closing type, no “quarter turn” ball valves shall be acceptable.

3. Ball valves for mainline isolation shall be constructed of a Sch. 80 PVC body, ball and stem. Ball valves shall have union connections with solvent weld socket adapters.

4. Ball valves for drip system flush valves shall be constructed of a Sch. 40 PVC body, ball and stem. Ball valves shall have solvent weld socket connections.

5. All ball 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.

C. Automatic Control Valves:

1. Automatic control valves shall be of the manufacturer, size, and type indicated on the drawings.

2. Automatic control valves include master valves, remote control valves and drip remote control valves.

3. Automatic control valves shall have nylon filled plastic bodies and bonnets, brass or stainless steel stems.

4. Automatic control valves shall be electrically operated.

5. Provide Christy's valve ID tags for each remote control valve with valve number.

D. Flow Sensors:

1. Flow sensors shall be of the manufacturer, size, and type indicated on the drawings.

2. Flow sensors shall be PVC TEE types with nylon impellers and epoxy encapsulated electronics.

2.5 VALVE BOXES

A. Valve boxes shall be of the manufacturer, size, and type indicated on the drawings.

B. Valve boxes shall be fabricated from a durable, weather-resistant plastic material resistant to sunlight and chemical action of soils.

C. The valve box cover shall be and secured with a hidden latch mechanism or bolts.

D. Valve box lids shall be black in color.

E. The cover and box shall be capable of sustaining a load of 1,500 pounds.

F. Valve box extensions shall be by the same manufacturer as the valve box.

G. The plastic irrigation valve box cover shall be an overlapping type.

H. Automatic control valve, master valve and flow sensor boxes shall be “standard” rectangular size. Valve box covers shall be marked "RCV" with the valve identification number, or “MV”, or “FS” “heat branded" onto the cover in 1 inch high letters / numbers.

I. Drip automatic control valve, master valve boxes shall be “jumbo” rectangular size. Valve box covers shall be marked "RCV" with the valve identification number "heat branded" onto the cover in 1 inch high letters / numbers

J. Ball valve, quick coupler valve, drip system flush valve, and controller grounding rod boxes shall be 10" circular size. Valve box covers shall be marked with “GV”, “BV”, "QCV", “FV” or “GRD” "heat branded" onto the cover in 1 inch high letters.

2.6 AUTOMATIC CONTROLLER

A. Automatic controller shall be of the manufacturer, size, and type indicated on the drawings.

B. Automatic controller shall be a weather based controller with all required equipment to provide flow sensing and communication with the Manufacturer’s weather data service or on-site weather sensor.

C. Automatic controller shall be a pre-assembled unit and equipped with all components indicated on the plans.

D. Controller enclosure shall be of the manufacturer, size, and type indicated on the drawings.

E. Controller shall be grounded according to local codes using equipment of the manufacturer, size, and type indicated on the drawings; or as required by local codes and ordinances.

2.7 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.

2.8 LOW VOLTAGE CONTROL WIRING

A. Remote control wire shall be direct-burial AWG-UF type, size as indicated on the drawings, and in no case smaller than 14 gauge.

B. Connections shall of the manufacturer, size, and type indicated on the drawings.

C. Common wires shall be white in color. Pilot wires shall be red in color. Spare wires shall be yellow in color.

D. Ground wires shall be green in color or bare copper and in no case smaller than 6 gauge.

2.9 IRRIGATION HEADS AND DRIP EMITTERS AND INLINE DRIP TUBING

A. Irrigation heads, drip emitters and inline drip tubing shall be of the manufacturer, size, type, with radius of throw, operating pressure, and discharge rate indicated on the drawings.

B. Irrigation heads, drip emitters and inline drip tubing shall be used as indicated on the drawings.

2.10 DRIP IRRIGATION EQUIPMENT

PART 3 - Drip tubing equipment such as flush valves, air relief valves, wye strainers and pressure regulators shall be of the manufacturer, size, and type indicated on the drawings.

3.1 MISCELLANEOUS EQUIPMENT

A. Landscape Fabric:

1. Landscape fabric for valve box assemblies shall be 5.0- oz. weight woven polypropylene weed barrier. Landscape fabric shall have a burst strength of 225 PSI, a puncture strength of 60 lbs. and capable of water flow of 12 gallons per minute per square foot.

2. Type: DeWitt Pro 5 Weed Barrier or approved equal.

PART 4 - EXECUTION

4.1 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 strict 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:

PART 5 - 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 at no additional expense to Owner.

A. Layout:

1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads, valves, 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.

B. Water Supply:

PART 6 - 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 at no additional expense to Owner.

A. 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 at no additional expense to Owner.

2. Contractor shall make electrical connections to the irrigation controller. Electrical power source to controller locations shall be provided by others.

3. Contractor shall make electrical connections to the irrigation controller. 230-volt single-phase electrical power source to pump assembly location shall be provided by others per NEC codes.

6.2 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 18 inches on pressure supply lines 1 ½" inches and larger.

C. Provide minimum cover of 18 inches for control wires.

D. Provide minimum cover of 24 inches for control wires within sleeves below paving.

E. Provide minimum cover of 36 inches on pressure supply lines under vehicular travel ways.

F. Provide minimum cover of 12 inches for non-pressure lines.

G. Pipes installed in a common trench shall have a 4-inch minimum space between pipes.

6.3 BACKFILLING

A. Backfill material on all lines shall be the same as adjacent soil free of debris, litter, and rocks over 1/2 inches in diameter.

B. 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.

C. Flooding in lieu of tamping is not allowed.

D. Under no circumstances shall truck wheels be used to compact backfill.

E. Provide sand backfill a minimum of 4 inches over and under all piping under paved areas.

6.4 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.

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 4 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 strict 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. Center load all plastic pipe prior to pressure testing.

J. All threaded plastic-to-plastic connections shall be assembled using Teflon tape or Teflon paste.

K. For plastic-to-metal connections, work the metal connections first. Use a non-hardening pipe dope an all threaded plastic-to-metal connections, except where noted

otherwise. All plastic-to-metal connections shall be made with plastic female adapters.

6.5 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.

D. The irrigation contractor shall register the controller with the Manufacturer and initiate the two (2) year central control / weather download service. The contractor shall fully program the controller to automatically adjust all programming aspects based on the downloaded weather data. The contractor shall provide all documentation and proof of registration and programming to the Owner.

6.6 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.

6.7 VALVES

A. Master valves, flow sensors, automatic control valves, drip automatic control valves, quick coupler, ball valves, drip system flush valves and drip system air relief 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 in the detail drawings.

D. Valves to be installed in valve boxes shall be installed one valve per box.

E. Provide valve ID tags for each remote control valve with valve number.

6.8 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, to a minimum depth of 4 inches in the bottom of the valve box. 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.

6.9 IRRIGATION HEADS DRIP EMITTERS AND INLINE DRIP TUBING

A. Irrigation heads, drip emitters and inline drip tubing shall be installed as indicated on the drawings.

B. Spacing of heads and inline drip tubing 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.

6.10 MISCELLANEOUS EQUIPMENT

A. Install all assemblies specified herein according to the respective detail drawings or specifications, using best standard practices.

B. Install devices such as flush valves, and air relief valves as indicated on the drawings and as recommended by the manufacturer.

6.11 FLUSHING THE SYSTEM

A. Prior to installation of irrigation heads, the valves shall be opened and a full head of water used to flush out the lines and risers.

B. Irrigation heads shall be installed after flushing the system has been completed.

6.12 ADJUSTING THE SYSTEM

A. Contractor shall adjust valves, align heads, and check the 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. The entire system shall be operating properly before any planting operations commence.

D. Automatic control valves are to be adjusted so that the irrigation heads, drip emitters and inline drip tubing operate at the pressure recommended by the manufacturer.

6.13 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 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 as indicated on the drawings when it is obviously inadequate, without bringing this to the attention of the Landscape Architect. This test shall be accepted by the Landscape Architect and accomplished before starting any planting.

E. Areas to be maintained for the formal maintenance period shall start maintenance at the same time, as directed by the Landscape Architect, Owner, and governing agencies. Partial areas will not be released into maintenance prior to completion of items listed in the pre-maintenance review. The maintenance period may not be phased.

F. If, after the maintenance review, the irrigation systems are not accepted by the Landscape Architect, the contractor shall reimburse the Architect for additional site visits, or additional time required to review work. All additional time will be billed at the Architect's hourly rate and will be paid for by the contractor at no additional cost to the owner.

G. Final inspection will not commence without record drawings as prepared by the Irrigation Contractor.

6.14 MAINTENANCE

A. 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.

6.15 COMPLETION CLEANING

A. 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 swept, and any damage sustained on the work of others shall be repaired to original conditions.

END OF SECTION

SECTION 329113
SOIL PREPARATION

1.GENERAL

1. SUMMARY

A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete and thorough preparation of the planting soil, including soil amendment products, imported topsoil, as required, to make up deficiencies in quantity of soil available on site, as shown in the Contract Drawings, and as specified herein this Section.

B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
   1. Agronomic Soil Fertility Testing and Soil Percolation Testing.
   2. Topsoil.
   3. Pre-Plant Weed Control.
   4. Soil Conditioners, Amendments and Fertilizers (Organic & Chemical).
   5. Amended Imported Soil Mixture for Raised Planters/On Structure Planters <<<VERIFY>>>
   6. Special Amended Planting Backfill Mixture for Palm Trees: <<<VERIFY>>>
   7. Amended Imported Soil Mixture for Planting Containers. <<<VERIFY>>>
   8. Amended Imported Soil Mixture for Backfilling Acid-Loving Plant Materials. <<<VERIFY>>>
   9. Special Amended Imported Aquatic Planting Medium for Submersible Planting Pots. <<<VERIFY>>>
   10. Structural Soil <<<VERIFY>>>

C. Related Sections: The following Sections contain requirements that relate to Work in this Section:
   1. Section 312219 – Landscape Grading.
   2. Section 321513 – Decomposed Granite Paving.
   3. Section 322800 – Irrigation Systems.
   4. Section 323223 – Segmental Retaining Walls. <<<VERIFY, planting in cell voids>>>
   5. Section 329200 – Lawns and Grasses.
   6. Section 329300 – Exterior Plants.
   7. Section 329330 – Tree and Shrub Transplanting. <<<VERIFY>>>
   8. Section 329360 – Palm Tree Planting. <<<VERIFY>>>
   9. Section 329400 – Landscape Planting Accessories.
   10. Section 329813 – Landscape Establishment Period.
   11. Section 321443 – *GrassPave*® Porous Paving. <<<VERIFY, planting in cell voids>>>
   12. Section 321446 – *Grasscrete*® Porous Paving. <<<VERIFY, planting in cell voids>>>
   13. Section 321449 – *Geoblock*® Porous Paving. <<<VERIFY, planting in cell voids>>>

2. DEFINITIONS AND APPLICABLE STANDARDS

A. References:

1. USDA – United States Department of Agriculture.
2. ASTM – American Society for Testing & Materials.

B. Definitions:

1. *Topsoil* - Shall be friable soil, providing sufficient structure in order to give good tilth and aeration to the soil. Topsoil shall be free of roots, clods, stones larger than one-inch (1") in the greatest dimension, pockets of coarse sand, noxious weeds, sticks, lumber, brush and other litter. It shall not be infested with nematodes or other undesireable disease-causing organisms such as insects and plant pathogens.
2. *Gradation Limits* - Soil shall be a sandy loam, loam, clay loam or clay. The definition of soil texture shall be per the USDA classification scheme. Gravel over ¼-inch in diameter shall be less than 20% by weight.
3. *Permeability Rate* - Hydraulic conductivity rate shall be not less than one-inch (1") per hour, nor more than twenty-inches (20") per hour, hen tested in accordance with the USDA Handbook Number 60, Method 34b, or other approved Methods.
4. *Fertility* - The range of the essential elemental concentration in soil shall be as follows:

Ammonium Bicarbonate/ DTPA Extraction (PPM)		
Element	Concentration of elements for Soil Selection, measured as mg/kilogram dry weight basis	Concentration of Elements for Final Acceptance (amended and conditioned soil) measured as mg/kilogram dry weight basis
Phosphorous	2 - 40	10 - 40
Potassium	40 - 220	100 - 220
Iron	2 - 35	24 - 35
Manganese	0.3 - 6	0.6 - 6
Zin	0.6 - 8	1 - 8
Copper	0.1 - 5	0.3 – 5
Boron	0.2 - 1	0.2 – 1
Magnesium	50 - 150	50 – 150
Sodium	0 - 100	0 – 100
Sulfur	25 - 500	25 – 500
Molybdenum	0.1 – 2	0.1 - 2

5. *Acidity* - The soil pH range measured in the saturation extract (Method 21a, USDA Handbook Number 60) shall be 6.0 – 7.9.
6. *Salinity* - The salinity range measured in the saturation extract (Method 3a, USDA Hand Number 60) shall be 0.5 – 2.0 dS/m. If calcium and if sulfate ions both exceed 20 milli-equivalents per liter in the saturation extract, the maximum salinity shall be 4.0 dS/m.
7. *Chloride* - The maximum concentration of soluble chloride in the saturation extract (Medoth3a, USDA Handbook Number 60) shall be 150 mg/1 (parts per million).
8. *Boron* - The maximum concentration of soluble boron in the saturation extract (Method 3a, USDA Handbook Number 60) shall be 1 mg/1 (parts per million).
9. *Sodium Adsorption Ratio (SAR)* - The maximum SAR shall be 3 measured per Method 20b, USDA Handbook Number 60.
10. *Aluminum* – Available aluminum measured with the Ammonium Bicarbonate/DTPA Extraction shall be less than 3.0 parts per million.
11. *Soil Organic Matter Content* - Sufficient soil organic matter shall be present to impart good physical soil properties but not be excessive to cause toxicity or cause excessive reduction in the volume of soil due to decomposition of organic matter. The desirable range is 3% to 5%. The carbon:nitrogen ratio should be about 10. A high carbon:nitrogen ratio can indicate the presence of hydrocarbons or non-humified organic matter.
12. *Calcium Carbonate Content* - Free calcium carbonate (limestone) shall not be present in acid-loving plants.
13. *Heavy Metals* - The maximum permissible elemental concentration in the soil shall not exceed the following concentrations:

Ammonium Bicarbonate/DTPA Extraction (PPM)	
Element	*(mg/kilogram) dry weight basis*
Arsenic	1
Cadmium	1
Chromium	10
Cobalt	2
Lead	30
Mercury	1
Nickel	6
Selenium	3
Silver	.5
Vanadium	3

a. If the soil pH is between 6 and 7, the maximum permissible elemental concentration shall be reduced 50% to the above values. If the soil pH is less than 6.0, the maximum permissible elemental concentration shall be reduced 75% of the above values. No more than three (3) metals shall be present at 50% or more of the above values.

14. *Phytotoxic constituent, herbicides, hydrocarbons, etc.* – Germination and growth of plants shall not be restricted more than 10% compared to the reference soil. Total petroleum hydrocarbons shall not exceed 50 mg/kg dry soil measured per the modified EPA Method No. 8015. Total aromatic volatile organic hydrocarbons (benzene, toluene, xylene and ethylbenzene) shall not exceed 0.5 mg/kg dry soil measured per EPA Method No. 8020.
15. *Sub Grade* - Soil level resulting from the rough grading work under another Section. Cultivation of sub grade areas prior to placement of Topsoil is included in this Section.
16. *Stockpiled Topsoil* - Soil stockpiled for spreading over prepared sub-grade.
17. *Stockpiled Native Topsoil* - Topsoil stripped from the site prior to rough grading Work (under another Section), to be spread and amended as Work under this Section.
18. *Imported Topsoil* - Off-site Topsoil, imported and stockpiled under this Section, to be spread and amended as Work under this Section.
19. *On-Structure* - Planted areas to be installed on top of concrete structure built under another Section. <<<VERIFY>>>
20. *Structural Soil* – An air-entrained, load-bearing mixture of quality aggregate, heavy clay loam, and a non-toxic, non-phytotoxic tactifier, specifically-formulated to support various pavement types while allowing voids for air exchange, water movement, organic matter, and root growth, identified under U.S. Patent #5,849,069.

C. Measurements:
1. PPM: Measurement, in parts per million.

3. SUBMITTALS

A. General:
1. Collect information into a single Submittal for each element of construction and type of product or equipment identified under this Section for review.
2. To expedite review, Submittal shall be organized and presented into specific sections or headings. Furnish neat, concise, legible, and clearly identifiable information, and sufficiently explicit detail, to enable proper evaluation for Contract compliance. Highlight catalog, product data, or brochures containing various products, sizes, and materials to show particular item submitted.
3. Submittal Format: As applicable, furnish Submittal as a single electronic digital PDF (Portable Document Format) file.

B. Digital Submittal Information:
1. Product/Material Data. Submit available product/material literature supplied by manufacturer's, indicating that their products comply with specified requirements. Provide manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of product/material.
a. Planting Soil (Imported/Amended Topsoil).

b. Soil Amendments (for each type used, for Sand, Perlite, Peat Humus, Gypsum, Soil Sulfur, Iron, etc).
c. Bulk Composted Organic Soil Amendment Material.
d. Granular Soil Conditioning Material.
e. Special Amended Imported Aquatic Planting Medium for Submersible Planting Pots <<<VERIFY>>>
f. Mycorrhizal Inoculum. <<<VERIFY>>>
g. Fertilizers (for each type used).
h. Structural Soil. <<<VERIFY>>>

2. Agronomic Soil Fertility Analysis and Recommendations: Submit a minimum of fourteen (14) days prior to amending of the soil and ordering soil amendments. The locations of where each of the soil test samples were derived from the Project Site shall be keyed to the site plan and shall be included with the results.
3. Qualification Data: Submit names for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience on similar installations.

C. Material Samples: Submit four (4) sets of physical Material Samples for review of kind, color, pattern, size, 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. Include the full range of exposed color and texture expected in the completed Work. Provide Material Samples bound and individually wrapped in re-sealable labeled 1-gallon plastic bags (as applicable):
1. Provide Material Sample sets for each item submitted under Product/Material Data.

D. Submittals under this Article will be rejected without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if the required information is missing or not presented in the format as requested.

E. No Work shall proceed under this Section until Submittal requirements indicated herein have been reviewed accordingly by the Landscape Architect.

4. QUALITY ASSURANCE AND CONTROL

A. Installer Qualifications for requirements indicated herein this Section:
1. Licensed Landscape Contractor, C-27, in the State of California. <<<VERIFY>>>
a. Engage an experienced, licensed Contractor who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
b. Installer's Field Supervision: Contractor shall maintain an experienced, full-time landscape supervisor/superintendent at the Project Site during times that landscaping operations identified herein the Contract are in progress.

B. Manufacturer's Directions: Follow Manufacturer's directions and drawings in cases where the Manufacturers of articles used in this Section furnish directions covering points not shown in the Contract Drawings or Contract Specifications.

C. Permits, Fees, Bonds, Testing, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, testing, and inspections necessary to perform and complete his portion of the Work.

D. Approved Testing Laboratory and Procedures for Agronomic Soil Fertility Analyses:
   1. Agronomic Soil Fertility Analyses shall be conducted by a reputable, certified, agronomic soils laboratory. Laboratory shall be a member of the Council on Soil Testing and Plant Analysis. The same laboratory shall be used throughout the duration of the Contract:
      a. Wallace Laboratories, El Segundo, CA. 310-615-0116.
      b. Soil and Plant Laboratory, Orange, CA. 714-282-8777.
      c. Fruit Growers Laboratory, Santa Paula, CA. 805-659-0910.
   2. Contractor shall verify and confirm the selected Testing Laboratory and specific location(s) of soil sample(s) with the Landscape Architect prior to commencing soil sampling operations.
   3. For each Soil type, submit the physical Soil Samples directly to the selected Laboratory for analysis, per the procedures outlined per Part III herein this Section.
      a. In addition to the physical Soil Samples, Contractor shall also provide the Laboratory with a copy of the Soil Amendment and Fertilizer products indicated herein this Section.
   4. Along with the testing data results, the Agronomic Soil Fertility Analysis shall also include written recommendations authored by the Laboratory conducting the Analyses for amending, treating, and/or correcting the sampled soils. Laboratory shall utilize the organic-based Soil Amendments and Fertilizers described herein this Section to the greatest extent possible to produce satisfactory planting soil(s) suitable for sustaining healthy viable plant growth.
      a. The Analyses shall also include Maintenance and Post-Maintenance fertilization programs for planted areas within the Contract.
   5. Agronomic Soil Fertility Analyses shall be performed on each Soil Type samples, and include testing results for the following:

pH;
Electro-conductivity (salinity) measurement – saturated extract.
Measurement of sodicity (Sodium Absorption Ratio);
Estimate of soil texture and soil organic matter;
Presence of lime;
Nutrients/Toxic Elements measurement of DPTA extract
Saturation extracts for nitrate, sulfate, sodium, calcium, magnesium, potassium, soluble phosphate, and boron;
Parasitic nematodes;
Herbicide contamination;
(For Lightweight Soil Mixes): Test for physical and chemical composition, and saturated weight per cu.ft.

6. Planting operations shall not commence until the results of the Agronomic Soil Fertility Analysis and Recommendations are reviewed accordingly by the Landscape Architect.
7. The quantity or type of amendments may be modified by the Landscape Architect within fourteen (14) days of receipt of the results. The Agronomic Soil Fertility Analysis and Recommendations shall take precedence over the amendment and fertilizer application rates specified herein or on the Contract Documents.
8. The Agronomic Soil Fertility Report/Recommendation shall take precedence over the amendment and fertilizer application rates specified herein or on the Contract Documents.

5. DELIVERY, STORAGE, AND HANDLING

A. General: Deliver and install materials so as to not delay Work, and install only after preparations for installation have been completed.
   1. Packaged Materials: Deliver packaged materials in original, unopened packages or containers, with manufacturer's labels intact and legible, showing weight, analysis, and name of manufacturer. Store and secure properly to prevent theft or damage.
      a. Store packaged materials off ground and under cover, away from damp surfaces and inclement weather.
      b. Protect during storage and construction against soilage or contamination from earth and other materials.
   2. Bulk Materials:
      a. Deliver and store bulk materials so as not to impede Work of others.
      b. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas, or plants.
      c. Protect during storage and construction against soilage or contamination from earth and other materials. Provide adequate separation between bulk materials so as not to cross-contaminate bulk materials.
      d. Store under cover, away from inclement weather.
      e. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water run-off, and airborne dust reaching adjacent properties, water conveyance systems, structures, or walkways.
      f. Accompany each delivery of bulk materials (fertilizers, amendments, topsoil, etc.) with appropriate certificates. Furnish original certificates to Landscape Architect upon request.

6. COORDINATION, SCHEDULING, AND OBSERVATIONS

A. Notify the Contractors performing Work related to installation of Work under this Section in ample time so as to allow sufficient time for them to perform their portion of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section. Coordinate items of other trades to be furnished and set in place.

B. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

C. Excavation: When conditions detrimental to adequate Soil Preparation operations are encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease operations and notify Landscape Architect for further direction.

D. Installation: Perform Soil Preparation operations only when weather and soil conditions are suitable in accordance with locally accepted practices.

E. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected materials immediately from Project site. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

7. SITE CONDITIONS

A. Project Site shall be free of weeds, native grasses, evasive grasses, (Bermuda Grass, Nut Grass, Kikiyu Grass, etc.) prior to Topsoil distribution or soil amendment placement.

B. Excessive rock, dead or declining vegetation, trash, debris, or other items that has accumulated throughout the duration of the Project shall be removed from the Project Site by the Contractor, and as directed by the Landscape Architect.

C. Grading and soil preparation Work shall be performed only during the period when beneficial and optimum horticultural results may be obtained. If the moisture content of the soil should reach such a level that working it would destroy soil structure or cause compaction, spreading and grading operations shall be suspended until, in the opinion of the Landscape Architect, the moisture content is increased or reduced to acceptable levels and the desired results are likely to be obtained.
   1. Soil moisture level prior to planting shall be no less than 75% of field capacity. The determination of adequate soil moisture for planting shall be in the sole judgment of the Landscape Architect.
   2. If the soil moisture level is found to be insufficient for planting, planting pits shall be filled with water and allowed to drain before commencing planting operations.

D. Planting areas which become compacted in excess of 85% relative compaction due to construction activities shall be tilled and thoroughly cross-ripped to a minimum depth of twelve-inches (12”) to alleviate the condition, taking care to avoid all existing subsurface utilities, drainage, etc.

8. SUBSTITUTIONS

A. Consideration: Materials to be considered equal to the Materials indicated herein this Section shall be reviewed by the Landscape Architect. Materials with equal performance characteristics produced by other Manufacturer’s and/or Distributors may be considered, providing deviations in dimensional size, color, composition, operation, and/or other characteristics do not change

the design concept, aesthetic appearance, nor intended performance, as solely judged by the Landscape Architect. The burden of proof on product equality is on the Contractor.

B. Specific reference to Manufacturer's names and products specified herein are used as standards of quality. This implies no right to the Contractor to substitute other materials without prior written approval by the Landscape Architect for Work under this Section.

C. Materials substituted and installed by the Contractor, without prior written approval by the Landscape Architect, may be rejected. Contractor shall not be entitled to be compensated by the Owner where the Contractor has installed rejected substitutions without receiving prior written approval.

D. Contract Price: Substituted Materials under this Section shall not increase the Contract price.

2.PRODUCTS

1. PLANTING SOIL (TOPSOIL)

A. Topsoil: Meet ASTM D5268, pH range of 5.5 to 7, 4 percent organic material minimum. <<<SELECT TOPSOIL SOURCE>>>

1. Topsoil Source: Reuse native surface soil stockpiled on the site. Verify suitability of native surface soil stockpiled on site to produce Topsoil meeting requirements; amend as necessary. Supplement native surface soil stockpiled on site with imported Topsoil when quantities are insufficient.
   a. Composition: Fertile, friable, well-drained soil, of uniform quality, free of stones over one-inch (1") diameter or larger in any dimension sticks, oils, chemicals, plaster, concrete, roots, plants, sod, and other deleterious or extraneous materials harmful to plant growth.
   b. Obtain an Agronomic Soil Fertility Report/Recommendation of the stockpiled Topsoil from the approved Testing Laboratory indicated herein this Section.
   c. Test Results: Request Testing Agency to send one (1) copy of test results direct to the Landscape Architect and one (1) copy to the Owner. Amend as required.
2. Topsoil Source: Provide Imported Topsoil obtained from off-site sources, from naturally well-drained sites; do not obtain from bogs or marshes.
   a. Quantity: Provide Imported Topsoil as soon as an insufficient quantity of native stockpiled surface soil is verified. Quantity of Imported Topsoil to complete the Work shall be calculated by Contractor.
   b. Stockpiling: Stockpile on site as directed by Owner.
   c. Composition: To match in quality, accepted native stockpiled Topsoil.
   d. Analysis: Obtain an Agronomic Soil Fertility Report/Recommendation of the Imported Topsoil from the approved Testing Laboratory indicated herein this Section.
   e. Review: Landscape Architect reserves the right to take samples of the Imported Topsoil delivered to the site for conformance to the Contract Specifications.
   f. Rejected Imported Topsoil: Immediately remove rejected Imported Topsoil off site, at Contractor's expense.

2. SOIL MIXES/BLENDS <<<VERIFY>>>

A. Soil Conditioner Blend, for amending on-site native soils or imported topsoil: Furnish a thoroughly blended composition of Bulk Composted Organic Soil Amendment Material and Granular Soil Conditioning Material & Fertilizer. Any substitution for the "Soil Conditioner Blend" listed herein must be requested by the Contractor and approved, in writing, by the Landscape Architect at least thirty (30) days prior to installation.

1. Bulk Composted Organic Soil Amendment Material:

a. Material Composition: Bulk Composted Organic Soil Amendment Material shall be produced from a composted, nitrolized blend of wood shavings, forest products, and/or rice hulls,. Upon completion of the composting process, the Material shall be thoroughly cured for a minimum of 100 days, and shall be free from any trash (glass, metal, plastic, etc.) deleterious materials, bio-solids, and/or toxic chemicals. The Material shall be non-hazardous, and conform to US Environmental Protection Agency 40 CFR503 criteria for "Class A" products. It shall also exceed standards and specifications for unrestricted application as a landscaping and agricultural soil amendment.

1) Gradation/Screen Analysis: A minimum of 90% of the material by weight shall pass a ½" screen. Material passing the screen shall meet the following criteria:

Percent Passing	*Sieve Designation*
85 - 100%	9.51 mm (3/8")
50 – 80%	2.38 mm (No. 8)
0 – 40%	500 micron (No. 35)

2) Maturity: Physical characteristics suggestive of maturity include shall include:

a) Color: Dark brown to black.

b) Odor: Aerobic, without malodorous presence of decomposition products.

c) Particle characterization: Identifiable wood pieces are acceptable but the balance of Material should be soil-like without recognizable grass or leaves.

b. Analytical Properties: Contractor shall submit proof of the Bulk Composted Organic Soil Amendment Material by providing a sample as identified herein this Section, and a lab analysis that has been performed within 30 days of the installation of the planting. Soil mix shall have (at a minimum) the following properties:

Material	*Minimum Targeted Property/Range*
Total Nitrogen (N%)	.50-1.0%

Phosphorus (as P2O5)	2.0%
Potassium (as K2O)	0.2%
pH (units)	6.0 to 7.5, as determined in saturated paste.
Organic Content	Minimum 50% based on dry weight and determined by ash method. Minimum 205 lbs. organic matter per cubic yard of compost.
ECe (millimho/cm)	<5.0; based on pre-leaching with equal volume of water.
Carbon-to-Nitrogen Ratio	<20-to-1, nitrogen stabilized.
Bulk Density	1,000 to 1,100 pounds/cubic yard.
Sodium Absorption Ratio (SAR)	Under 20.0
Total Iron	1.5%3.
Moisture Content	35%-60%
Acid-soluable Ash content	No less than 6% and no greater than 20%.
Salt Content	<10millimho/cm @ 25d C. on a saturated paste extract.
Boron Content	<1.0 parts per million on a saturated paste extract.
Silicon-Content (acid-insoluable ash)	<50%
Calcium Carbonate	No presence on alkaline soils.
Maximum Total Permissible Pollutant Concentrations (in PPM on a dry-weight basis)	• Arsenic: 20 • Cadmium: 15 • Chromium: 300 • Cobalt: 50 • Copper: 150 • Lead: 200 • Mercury: 10 • Molybdenum: 20 • Nickel: 100 • Selenium: 50 • Silver: 10 • Vanadium: 500 • Zinc: 300

c. Application Rate: As indicated herein this Section under "Planting Soil Amendments Schedule".

d. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
   1) *Soil Conditioner*, Synagro Professional Organic Soil Products.
   2) *Agromend*, Agromin Horticultural Products.
   3) *Humic Compost ½"*, Greenway Compost.
   4) *Superior Blend Compost*, Artesia Sawdust Products, Inc.
   5) *Compost*, EarthWorks Soil Amendments, Inc.
   6) *Contractor's Blend*, Recycled Wood Products (RWP).
   7) *#SSA-CST Supreme Organic Soil Amendment*, Plants Choice, Inc.
   8) *Humic Compost 3/8",* Agri Service, Inc.
   9) Or equal, as approved by the Landscape Architect.

2. Granular Soil Conditioning Material & Fertilizer:

a. Material Composition and Analytical Properties: Granular Soil Conditioning Material & Fertilizer shall be a singular manufacturer-blended combination of soil conditioning material and fertilizer. It shall be granular in form, long-lasting, free flowing, and suitable for application with approved equipment. It shall not contain any sewage sludge or manure-based products, and shall contain the following guaranteed minimum available analysis range:

Element/Material	*Targeted Property Range*
Nitrogen (N)	5.0% to 6.0%
Phosphoric Acid (as P2O5)	2.0% to 3.0%
Potash (as K2O)	1.0% to 4.0%
Humic Acids	15.0 % to 20.0%
Calcium	7.0%
Sulfur	0.0% to 5.0%

b. Commercial-Grade Products, Manufacturers and Associated Rates of Application: Subject to compliance with requirements, provide products by one (1) of the following:
   1) *Tri-C 6-2-4*, Tri-C Enterprises LLC, Chino, CA. 800-927-3311.
      a) Application Rate at 70 lbs. per 1,000 square feet of planting area.
   2) *Gro-Power Plus 5-3-1*, Gro-Power, Chino, CA. 909-393-3744.
      a) Application Rate at 200 lbs. per 1,000 square feet of planting area.
   3) or equal, as approved by the Landscape Architect.

B. Amended Imported Soil Mixture for Raised Planters/On Structure Planters: <<<VERIFY>>>
   1. Submit to Landscape Architect for evaluation.

2. Weight: Approximately 1,700 lbs. per Cubic yard (CY), or 63 pounds per cubic foot (CF)
3. Thoroughly blend and mix the following:

Amended Imported Soil Mixture for Raised Planters/On Structure Planters (per Cubic Yard)	
Amount	*Material*
2 parts (1/2 cubic yard)	Washed Plaster Sand, as indicated herein this Section, or coarse green sand.
1 part (1/4 cubic yard)	Bulk Composted Organic Soil Amendment Material, as indicated herein this Section
1 part (1/4 cubic yard)	Peat Humus, as indicated herein this Section
1 lb.	Calcium Nitrate
3 lbs.	Single Superphosphate
2 lbs.	Perlite
3/4 lbs.	Sulfate of Potash
9 lbs.	Gypsum

4. Furnish Mixture in sufficient quantities which allow for natural settling and compaction of the Mixture in the planting vessel prior to installing Plant Materials. (Contractor shall anticipate approx. 15% of settling of product during applications). Planting vessels shall be compacted to 85% density to minimize settling. Set Mixture and compact accordingly in 6" lifts, to within 2" of top of the planting vessel.

C. Amended Imported Topsoil in Porous Paving (Grasscrete™ / GrassPave™ / Geoblock™) cell voids: <<<VERIFY>>>
1. Furnish Imported Topsoil, with Soil Conditioner Blend, as indicated herein this Section.

D. Special Amended Planting Backfill Mixture for Palm Trees: <<<VERIFY>>>
1. Submit to Landscape Architect for evaluation.
2. Thoroughly blend and mix the following:

Special Amended Planting Backfill Mixture for Palm Trees (per Cubic Yard)	
Amount	*Material*

4 parts (4/5 cubic yard)	Washed Plaster Sand, as indicated herein this Section
1 part (1/5 cubic yard)	Topsoil (Native or Imported)
10 pounds	Palm Tree Fertilizer, as indicated herein this Section

3. Furnish Mixture in sufficient quantity which allows for natural settling and compaction of the Mixture. Blend mixture thoroughly to incorporate all materials prior to backfilling in excavated pit.

E. Amended Imported Soil Mixture for Planting Containers: <<<VERIFY>>>
1. Submit to Landscape Architect for evaluation.
2. Weight: Approximately 800 lbs. per Cubic yard (CY), or 30 pounds per cubic foot (CF).
3. Thoroughly blend and mix the following (screen size at 3/8" maximum):

Amended Imported Soil Mixture for Planting Containers (per Cubic Yard)	
Amount	*Material*
1/2 cu. yd.	Washed Plaster Sand, as indicated herein this Section
1/4 cu. yd.	Bulk Composted Organic Soil Amendment Material, as indicated herein this Section
1/4 cu. yd.	Peat Humus, as indicated herein this Section
1 lb.	Calcium Nitrate
3 lbs.	Single Superphosphate
2 lbs.	Perlite
3/4 lbs.	Sulfate of Potash
9 lbs.	Gypsum
Per Manufacturer's recommended rate of application	Wetting Agent/Water Storing Polymer

4. Furnish Mixture in sufficient quantities which allow for natural settling and compaction of the Mix prior to installing Plant Materials. Mixture shall be compacted to 85%

density to minimize settling. Set Mixture and compact accordingly in six-inch (6") lifts, to within two –inches (2") of top of the Planting Container.

F. Amended Imported Soil Mixture for Backfilling Acid-Loving Plant Materials (azaleas, camellias, ferns, gardenias, etc. and other plant materials, as directed by the Landscape Architect): <<<VERIFY>>>

1. Submit to Landscape Architect for evaluation.
2. Thoroughly blend and mix the following:

Amended Imported Soil Mixture for Backfilling Acid-Loving Plant Materials (per Excavated Plant Pit)	
Amount	*Material*
2 Parts	Excavated Soil from Plant Pit.
1 Part	Bulk Composted Organic Soil Amendment Material, as indicated herein this Section.
2 Parts	Peat Humus, as indicated herein this Section.

G. Special Amended Imported Aquatic Planting Medium for Submersible Planting Pots: <<<VERIFY>>>

1. Pre-packaged, kiln-fired, inert and specifically formulated blend of 100% natural amendments and minerals, non-toxic, and ideal for aquatic plant growth and hydroponics. Holds firmly in-place, retains oxygen, free of algae-promoting nutrients, with ideal nutrients for plant absorption, pH neutral and stable, and safe for fish and other aquatic life. Medium shall not break-down, float, color, nor cloud water.
2. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
   a. *Aquatic Soil*, Schultz.
   b. *Aquatic Plant Medium*, Microbe Lift.
   c. *Aquatic Planting Medium,* Pond Care.
   d. Or equal, as approved by the Landscape Architect.
3. Furnish Medium in sufficient quantities which allow for natural settling and compaction of the Medium prior to installing Plant Materials. Medium shall be compacted to 90% density to minimize settling.

H. Structural Soil <<<VERIFY>>>

1. Thickness: Designed depth to subgrade, or a minimum depth of 36 inches. The sub-grade should be excavated to parallel the finished grade.
2. Sub-Drainage: Conforming to approved engineering standards, provided beneath the Structural Soil material.
3. Material Components, homogeneously blended in the following proportions by volume:

Material	Description	Volume
Crushed Stone	Hard durable aggregates (granite or limestone), clean, angular, uniformly-graded from 3/4 -1 1/2 inch, free from any foreign elements or materials, engineered for load-bearing capacities, with no fines.	4 cu meters
Growing Medium	Conform to the USDA Soil Classification System for Clay Loam, as follows: Gravel <5% Sand 25-30% Silt 20-40% Clay 25-40%) Organic Matter (percent of dry weight): 5% and 8%. Acidity (pH): 6.0 to 7.0 Salinity (saturated extract conductivity): Do not exceed 3.0 millihos/cm @ 25d. C.	1.5 cu meters
Hydrogel	Non-toxic, potassium propenoate-propenamide copolymer, added in a small amount to act as a tackifier, preventing separation of the stone and soil during mixing and installation.	2 kg
Water	Clean, potable.	As required. Quantity to vary depending on the moisture content of the Growing Medium.

4. Total moisture at mixing shall be 10% (per AASHTO T-99 optimum moisture).
5. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
   a. *CU-Structural Soil®,* Gail Materials, Corona, CA.
   b. Or equal, as approved by the Landscape Architect.

6. Furnish material in sufficient quantities which allow for natural settling and compaction of the material prior to installing Plant Materials. Material shall be compacted to achieve the equivalent of 95% Modified Proctor Density to minimize settling.

3. ORGANIC SOIL AMENDMENT COMPONENTS

A. Washed Plaster Sand: Clean, washed, natural or manufactured sand, sharp, fine-textured, free of toxic materials. Sieve tested in accordance with ASTM C136, with 100% passing through a #4 screen, 0% passing through a #200 screen.
   1. Chemical Properties: (by DPTA Saturation Extract Method):
      a. Soluble Salts/Salinity: Maximum conductivity of 3.0 millimhos/cm at 25 degrees C.
      b. Boron: Maximum concentration of 1.0 PPM.
      c. Sodium Absorption Ratio (SAR): Maximum 6.0.
      d. pH: 7.0.

B. Perlite: Horticultural Perlite, soil amendment grade, 6.5 to 7.5 pH.
   1. Unacceptable Materials: Polystyrene beads shall not be used as a substitution for horticultural Perlite.

C. Vermiculite: Horticultural Vermiculite, gold-brown in color.
   1. Size: 2-4mm, 5 mesh to 10 mesh sieve size.
   2. Density: 4.5 to 5.5 lb./cuft.
   3. Grade: #2, Medium Grade.

D. Peat Humus:
   1. Type: Canadian Sphagnum Peat, as derived from the genus Sphagnum, medium-divided, coarse fibrous texture, brown in color.
   2. Measurement: Measure peat in air dry condition, containing not more than 35% moisture by weight on an "as-received" basis.
   3. Physical Properties:

Percent Passing	Sieve Size
95 - 100%	9.51 mm (3/8 in.)
0 - 40%	500 micron (#35, 32 mesh)

   4. Organic Content (dry weight basis): Minimum 95%.
   5. Fiber Content: Greater than 66%.
   6. Water Holding Capacity: 20x to 30x its dry weight in water.
   7. Range in Ash Content (%): 1.0 to 5.0.
   8. Chemical Properties:
      a. Nitrogen (dry weight basis): 0.6-3.0%.

b. Salinity/Soluble Salts: Saturation extract conductivity 0.0-3.0 millimhos/cm @ 25 degrees C.
c. pH range: 3.0 to 4.0.

9. Unacceptable Materials:
a. Coir Dust.
b. Sedge Peat.
c. Reed Peat.
d. Hypnum Peat.

E. Mycorrhizal Inoculum: <<<VERIFY>>>

1. Mycorrhizal Inoculum for Plant Material (not Palm Trees): Dual soil-conditioning biological inoculum system of endo-and ecto- Mycorrhizal, used to further aid the plants ability to efficiently uptake available soil nutrients and increase resistance to drought.
a. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
1) *7-gram Myco-Pak*, Tri-C Enterprises LLC, Chino, CA, 800-927-3311.
2) *4 oz. Packet - Roots 1 Step*, Roots, Inc., Independence, MO, 800-342-6173.
3) Or equal, as approved by the Landscape Architect.
b. Provide at the prescribed application rate, per the Manufacturer's written recommendations.

2. Mycorrhizal Inoculum for Palm Trees: <<<VERIFY>>> Soil-conditioning biological inoculum of endomycorrhizal, humic acids, biostimulants, soluble sea kelp, yucca plant extract, and NPK 1-3-1 nutrients, used to further aid a palm tree's ability to efficiently uptake available soil nutrients and increase resistance to drought.
a. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
1) *DieHard™ Palm Transplant,* Horticultural Alliance, Sarasota, FL, 800-628-6373.
2) *7-gram Myco-Pak*, Tri-C Enterprises LLC, Chino, CA, 800-927-3311.
3) Or equal, as approved by the Landscape Architect.
b. Provide at the prescribed application rate, per the Manufacturer's written recommendations.

3. Mycorrhizal Inoculum for Plant Materials from Hydromulch-type Applications<<<VERIFY>>>: To be added as part of the Hydromulching operations, providing a dual soil-conditioning biological inoculum system of endo-and ecto-Mycorrhizal to further aid the immature plant's ability to efficiently uptake available soil nutrients and also increase resistance to drought.
a. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
1) *Tri-C Endo 120,* Tri-C Enterprises LLC, Chino, CA, 800-927-3311.
2) *Gro-Life,* Gro-Power, Gro-Power, Chino, CA. 909-393-3744.
3) Or equal, as approved by the Landscape Architect.
b. Provide at the prescribed application rate per the Manufacturer's written recommendations, or as indicated herein this Section.

4. CHEMICAL SOIL AMENDMENT COMPONENTS

A. General: Chemical Soil Amendment Components listed herein may or may not be used, depending on the results of the Agronomic Soil Fertility Report. Provide as required:

B. Gypsum: Commercially-processed and packaged agricultural-grade hydrated calcium sulfate product (CaSO4), 92.0% minimum, pH at 7.1.
   1. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
      a. *Ben Franklin® No. 1 Agricultural Gypsum*, U.S. Gypsum Company.
      b. *100% Good Stuff Gypsum™,* Art Wilson Company.
      c. *CAL-SUL® Pelletized Agricultural Gypsum,* North Pacific Group.
      d. *Bumper Harvest Agricultural Gypsum*, Domtar Gypsum.
      e. *Premium 97 Solution-Grade Gypsum,* Diamond K, Inc.
      f. Or equal, as approved by the Landscape Architect.

C. Soil Sulfur: Elemental Sulfur (90% min.) commercially manufactured, water degradable, palletized.
   1. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
      a. *Disper-Sul*, Martin Resources, Inc.
      b. *Soil Sulfur*, Red Top.
      c. Or equal, as approved by the Landscape Architect.

D. Iron: Non-staining, 40% Fe minimum, complete with micro-nutrients and 2% humic acids, as derived from iron oxide, manganese oxide, or zinc oxide.
   1. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
      a. *Gro-Power Iron*, Gro-Power, Chino, CA.
      b. *Iron 45 w/ Micronutrients*, Tri-C Enterprises LLC, Chino, CA.
      c. Or equal, as approved by the Landscape Architect.

E. Dolomite Lime: Agricultural-grade mineral soil conditioner containing 35% minimum magnesium carbonate, and 49% minimum calcium carbonate, 100% passing #65 sieve.

F. Potassium Sulfate (Sulfate of Potash K2O), (0-0-50 guaranteed analysis N-P2O5-K2O): Agricultural-grade, containing minimum 50% of water-soluble potash and 18% Sulfur (S).

G. Single Superphosphate P2O5 (0-15-0 guaranteed analysis N-P2O5-K2O): Commercial product, containing 15% available phosphoric acid and 14% Sulfur.

H. Triple Superphosphate P2O5, (0-45-0 guaranteed analysis N-P2O5-K2O): Commercial product, containing 45% available phosphate and 15% Calcium (Ca).

I. Ammonium Sulfate (NH4)2SO4, (21-0-0 guaranteed analysis N-P2O5-K2O): Commercial product containing approximately 21% ammonia.

J. Ammonium Nitrate NH4NO3, (34-0-0 guaranteed analysis N-P2O5-K2O): Commercial product containing approximately 34% ammonia.

K. Calcium Nitrate CaNO3, (15.5-0-0 guaranteed analysis N-P2O5-K2O): Agricultural grade containing 15-1/2% nitrogen.

L. Potassium Nitrate KNO3, (13-0-45 guaranteed analysis N-P2O5-K2O): Commercial product containing approximately 13% nitrogen and 45% potassium.

M. Ureaformaldehyde (38-0-0 guaranteed analysis N-P2O5-K2O): Granular commercial product containing approximately 38% nitrogen.

N. Urea CO(NH2)2, (46-0-0 guaranteed analysis N-P2O5-K2O): Granular commercial product containing 46% nitrogen.

O. I.B.D.U. (Iso Butyldiene Diurea): Commercial product containing 31% nitrogen.

5. FERTILIZERS

A. Composition: Nitrogen (N), phosphorous (P2O5), and potassium (K2O) content, plus other elements, as indicated.

B. Palm Tree Fertilizer (pre-plant 9-3-9) <<<VERIFY>>>:
1. Organic-based, long-lasting, controlled-release, uniform in composition, free flowing, granular- type fertilizer with micronutrients, suitable for application with approved equipment.
2. Palm Fertilizer shall contain the following minimum available percentages by weight of plant food (pending results of soil analysis):

Element/Material	Targeted Property Range
Nitrogen (N) - Slow Release	9.0% minimum
Phosphoric acid (as P2O5)	3.0% minimum
Potash (as K2O)	9.0% minimum
Calcium (Ca)	3.0% minimum
Magnesium (Mg)	4.0% minimum
Sulfur (S)	6.0% minimum
Iron (Fe)	2.0% minimum
Manganese (Mg)	0.05% minimum
Zinc (Z)	0.05% minimum
Humus	25.0% minimum

Humic Acids w/ micronutrients	5.0% minimum

3. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
   a. Gro-Power 9-3-9 Palm & Tropical with Micronutrients, Gro-Power, Chino, CA. 909-393-3744.
   b. Or equal, as approved by the Landscape Architect.
4. Application Rate: Per Manufacturer's current printed recommendation.

C. Turf Grass Starter Fertilizer (pre-plant 3-12-12), as required <<<VERIFY>>>:
1. General: Shall be applied for turf grasses planted from sod or seed (not hydroseed or hydrostolons).
2. Fertilizer shall be an organic-based, long-lasting, controlled-release, uniform in composition, free flowing granular-type fertilizer with micronutrients, suitable for application with approved equipment. Fertilizer shall be high in potassium and phosphorous elements to aid in strong root development.
   a. Turf/Lawn Fertilizer shall contain the following minimum available percentages by weight of plant food (pending results of soil analysis):

Element/Material	*Targeted Property Range*
Nitrogen (N) Slow Release	3.0% minimum
Phosphoric acid (as P2O5)	12.0% minimum
Potash (as K2O)	12.0% minimum
Humus	35.0% minimum
Humic Acids w/ micronutrients and soil enhancers	7.0% minimum

3. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
   a. *Gro-Power 3-12-12 Flower & Bloom,* Gro-Power, Chino, CA. 909-393-3744.
   b. Or equal, as approved by the Landscape Architect.
4. Application Rate: Twenty (20) pounds per 1,000 SF.

D. Hydroseed/Hydrostolon Slow-Release Fertilizer, as required (refer to Section 329200 – Lawns & Grasses) <<<VERIFY>>>

1. Pelleted- or granular-form fertilizer, organic-based, long-lasting, controlled-release, uniform in composition, free flowing, singular manufacturer-blended combination of soil conditioning material and fertilizer with micronutrients, suitable for application with approved equipment. It shall not contain any sewage sludge or manure-based products, and shall contain the guaranteed minimum available analysis range. Installed in the hydroseed/hydrostolon slurry mix, and consisting of the following minimum available percentages by weight of plant food:

Element/Material	*Targeted Property Range*
Nitrogen (N)	5.0% to 6.0%
Phosphoric acid (as P2O5)	2.0% to 3.0%
Potash (as K2O)	1.0% to 4.0%
Humic Acids	15.0% to 20.0%
Calcium (Ca)	7.0%
Sulfur (S)	0.0% to 5.0%

2. Commercial-Grade Products, Manufacturers and Associated Rates of Application: Subject to compliance with requirements, provide products by one (1) of the following:
   a. *Tri-C 6-2-4*, Tri-C Enterprises LLC, Chino, CA, 800-927-3311.
      1) Application Rate at 70 lbs. per 1,000 square feet of planting area.
   b. *Gro-Power Plus 5-3-1*, Gro-Power, Chino, CA. 909-393-3744.
      1) Application Rate at 200 lbs. per 1,000 square feet of planting area.
   c. Or equal, as approved by the Landscape Architect.

E. Fertilizer Tablet:
   1. General: Fertilizer Tablet shall be a 7-gram tablet, organic-based, tightly compressed chip-type commercial grade, 12-month slow-release planting tablets, and shall be composed of the following available percentages by weight of plant food:

Element/Material	*Targeted Property Range*
Nitrogen (N)	12.0% minimum
Phosphoric acid (as P2O5)	8.0% minimum
Potash (as K2O)	8.0% minimum
Humus	20.0% minimum

Humic Acids w/ micronutrients and soil enhancers	4.0% minimum

2. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
   a. *Gro-Power 12-8-8 Planting Tablets*, Gro-Power, Chino, CA 909-393-3744.
      1) Application Rate: As indicated herein Part III this Section.
   b. Or equal, as approved by the Landscape Architect.

F. Fertilizer Tablet for Aquatic Planting <<<VERIFY>>>:
1. General: Specifically-formulated Fertilizer Tablet for aquatic plants. Tablets shall be a minimum 4.25 gram tablet, organic-based, tightly compressed chip-type commercial grade, 12-month slow-release planting tablets, formulated to feed all pond plants while minimizing the releasing of chemicals into the water that would encourage algae growth. Safe for use with fish when used as directed. Tablets shall be composed of the following available percentages by weight of plant food:

Element/Material	*Targeted Property Range*
Nitrogen (N)	10.0% minimum
Phosphoric acid (as P2O5)	14.0% minimum
Potash (as K2O)	8.0% minimum

2. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
   a. *PondTabbs Planting Tablets*, Pondtabbs.
      1) Application Rate: Per Manufacturer's printed directions.
   b. Or equal, as approved by the Landscape Architect.

6. ACCESSORIES

A. Drain Rock/Aggregate: Crushed Stone, conforming to ASTM C33, graded to ¾"-size, clean, hard, durable, free of materials toxic to plant growth, set in bottom of Planters, at depth indicated in Contract Drawings. Provide Geotextile Filter Fabric between Drain Rock/Aggregate and amended planting backfill soil.
1. Drain Rock/Aggregate for planters containing bamboo plant material species: <<<VERIFY>>>
   a. Crushed lava rock cinders, graded to 3/16" size.
   b. Geo-textile Filter Fabric shall be omitted.

B. Wetting Agent/Water Storing Polymer: Non-biodegradable, granular, polyacrylamide polymer soil amendment.
   1. Commercial-Grade Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
      a. *Broadleaf P4*, Broadleaf Industries, Inc. Chula Vista, CA 619-424-7880.
      b. Or equal, as approved by the Landscape Architect.

C. Drainage Mat: <<<VERIFY>>>
   1. Description: Two (2) -layer composite polyester non-woven filter fabric, bonded to a compression resistant nylon matting of open, three-dimensional construction.
   2. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
      a. *#9010,* American Enka, as distributed by American Excelsior Co., 916-383-3835.
      b. ADD MORE HERE – BLUE/Black Binder
      c. Or equal, as approved by the Landscape Architect.

D. Perforated Drain Pipe & Drain Sock (Tree Chimney): Refer to Section 329400 – Landscape Planting Accessories.

E. Landscape Mulch Material: <<<VERIFY>>>
   1. Organic Wood Mulch: Refer to Section 329400 – Landscape Planting Accessories.
   2. Decomposed Granite: Refer to Section 321513 – Decomposed Granite.
   3. Landscape Mulch Material for Submersible Planting Pots: Refer to Section 329400 – Landscape Planting Accessories.

3.EXECUTION

1. AGRONOMIC SOIL FERTILITY REPORT/RECOMMENDATION <<<SELECT OPTION "A" or OPTION "B">>>

OPTION A (TESTING IN BID):

A. Once rough grading has been accomplished, and prior to commencing Soil Preparation operations, (amendments, fertilizers, etc.), soil samples shall be taken from representative areas and below grade depths of the Project Site. Locations and depths to gather the representative soil samples shall be accomplished by the Contractor under the direction of the Landscape Architect.
   1. Provide <<<ADD QUANTITY HERE>>> Soil Samples.

B. Guidelines for Selecting the Soil Samples:
   1. Select representative areas to sample. The area needs to be uniform in color, texture, depth, and drainage with the same fertilizing program and type of use. Planting areas to receive lawns, flowerbeds, trees, cut areas, fill areas, etc. should be tested separately. An area containing multiple trees and shrubs can be grouped into one area if the planting is the same.
   2. Depths and process of soil sampling:

a. Sample as deep as the soil will be amended, generally six-inches (6") deep for groundcover/lawns, eighteen-inches (18") deep for shrub areas, twenty-four-inches (24") deep for small boxed trees, and three-feet (3') to four-feet (4') for large boxed trees.
b. Use a soil probe or soil auger to remove a core sample; otherwise, use a shovel to dig a hole to the desired depth. Sample the soil from the side of the excavated hole, scraping the side with a trowel. The tools used for digging shall be clean and not rusty. Avoid sampling when the soil is too wet.

3. In desired areas where multiple sub-samplings are taken from any one (1) area to create a combined sample, mix the sub-samples homogenously together in a clean plastic bucket prior to placing in the plastic bag.
4. Each Sample shall be sent directly to the laboratory in a separate, re-sealable, one (1)-gallon plastic bag. Provide a minimum of four (4) cups of soil within each respective sample to allow for adequate testing.

OPTION B (TESTING IN BID):

C. General: Agronomic Soil Fertility Testing shall be under the management and direction of the Owner and/or Landscape Architect.

D. Agronomic Soil Fertility Testing Bid Allowance: Contractor shall provide a Bid Allowance within the Contract price from which all Agronomic Soil Fertility Testing for the Project shall be performed:
1. Amount: $X,XXX.00

E. Contractor shall not be entitled to any fee, payment, stipend, grant, mark-up, or any other financial gain or incentive for any Work performed under the Agronomic Soil Fertility Testing Bid Allowance.
1. At the direction of the Owner and/or Landscape Architect, Contractor shall be responsible to provide payment(s) to the Agronomic Soil Testing Laboratory for Work under the Agronomic Soil Fertility.
2. Testing Bid Allowance. Each payment made on the Laboratory's invoice shall be paid in full and within a timely fashion not to exceed thirty (30) days from the date of the invoice, as to not delay any Work under the Contract.
3. At the completion of Work indicated herein this Article, the Contractor shall provide legible photocopies of all invoices and payments made to the Agronomic Soil Testing Laboratory, under the Agronomic Soil Fertility Testing Bid Allowance, to the Owner and/or Landscape Architect. All money remaining in the Allowance shall be refunded to the Owner as a condition of Final Acceptance of Work.

F. Procedures:
1. Owner and/or Landscape Architect shall be responsible to retain a reputable and certified Agronomic Soils Testing Laboratory for Work under the Contract. The selected Laboratory shall also be a member of the Council on Soil Testing and Plant Analysis:
a. Wallace Laboratories, El Segundo, CA, phone 310-615-0116.
b. Soil and Plant Laboratory, Orange, CA, phone 714-282-8777.
c. Fruit Growers Laboratory, Santa Paula, CA, phone 805-659-0910.

2. Upon the direction of the Owner and/or Landscape Architect, the Agronomic Soils Testing Laboratory shall provide Standard Agricultural Suitability Analyses and other Specific Soil Tests.
   a. Contractor shall notify the Owner and Landscape Architect, in writing, of the Work schedule for the stages of Work indicated herein this Article. The Agronomic Soils Testing Laboratory shall be provided access to the Project Site to gather soil samples, as required, to perform the ensuing Laboratory tests. Soil samples shall be gathered from representative locations throughout the Project Site, by qualified Laboratory personnel, during the following stages of Work:
      1) Prior to Rough Grading Operations.
      2) During Rough Grading Operations.
      3) Post Rough Grading Operations, and prior to the establishment of Finished Grades and the application of topsoil, soil amendments, and/or fertilizers).
      4) Post Finished Grading Operations, and prior to Planting Operations.
      5) During Planting Operations, including Soil Excavation, Planting, and Soil Backfill.
      6) After Planting Operations and prior to preparation of the Punch List.
      7) After halfway completion of the Contracted Landscape Establishment Period.
   b. The Agronomic Soils Testing Laboratory shall provide the Owner, Landscape Architect, and Contractor with the results of all Soil Testing Analyses performed during each respective stage of Work as indicated herein this Article. The Analyses shall include the soil chemical compositions and recommendations to remedy the soil. The recommendations shall include provisions for using soil amendments and fertilizers indicated herein this Section.

2. SOIL PERCOLATION TESTING

A. Type/Quantity: During operations of Agronomic Soil Fertility Testing and prior to installing Plant Material, Contractor shall perform Soil Percolation Tests, through the direction of the Landscape Architect, in selected representative areas of the Project Site, to verify acceptable natural drainage, soil structure, and soil composition. Contractor shall verify the locations of the Soil Percolation Tests with the Landscape Architect.
   1. Required Number of Soil Percolation Tests: <<<PROVIDE HERE>>>

B. Procedure: Each Soil Percolation Test shall be performed as follows:
   1. Dig a hole: 2’-0” wide x 2’-0” long x 2’-0” deep.
   2. Fill the hole with water to top and cover with plywood and barricade. Allow hole to drain and fill again to top.
   3. Make daily observations, noting the depth of water each day.
   4. Report findings, in writing, to the Landscape Architect. Include the length of time the water takes to drain completely from each hole, date of test, location, and other information, which may be useful in providing further recommendations.

C. Results: Based on the combined results of the Agronomic Soil Fertility Testing and the Soil Percolation Tests, Contractor may be required to install additional tree drainage sumps or other drainage methods at each planting pit for trees larger than 15-gallon container stock. This does not relieve the Contractor’s obligation within the Base Bid to provide the required Tree Root

Aeration Units indicated in Section 329400 – Landscape Planting Accessories. Contractor shall include, as a line-item price within the Base Bid, the price per each additional tree drainage sump, should they be required (based on the testing). Should additional tree drainage sumps or other methods is required, compensation shall be awarded to the Contractor at the line-item price (each) as provided by the Contractor.

3. SOIL MOISTURE CONTENT

A. General: Do not work soil when moisture content is so great that excessive compaction occurs, or when it is so dry that dust will form in air, or that clods will not break readily. Apply water, if necessary, to bring soil to an optimum moisture content for tilling and planting. Soil moisture level prior to planting shall be no less than 75% of field capacity. The determination of adequate soil moisture for planting shall be the judgment of the Landscape Architect. Range: Maintain within two-percent (2%) above or below optimum moisture content at times during Work.

4. SITE CONDITIONS

A. Contractor shall protect existing and new improvements and systems installed prior to planting installation. Maintain protection in place until completion of Work and contracted Landscape Establishment Period.

B. Protect concrete paving, headers, and drainage from staining due to contact with wet nitrogen stabilized mulch/sawdust, or contact with chelated iron. Correct any stained concrete.

5. CLEARING & CULTIVATION

A. Clearing: Clear planting areas free of stones two-inches (2”) in diameter and larger, weeds, debris, and other extraneous materials prior to soil preparation Work.

B. Pre-Plant Weed Control:
   1. Clear and remove existing weeds by spraying and grubbing to at least one-inch (1”) below the soil surface.
   2. Dead weeds shall be cleared and removed prior to planting.
   3. Maintain a weed-free Project Site until final acceptance by the Owner, utilizing mechanical, chemical, or manual treatment.

C. Cultivation of Native Site Soil and/or Spreading Imported Topsoil, with Amendments/Fertilizers:
   1. Verification: In planting areas where Imported Topsoil will be applied, verify that sub-grades prior to installation of Imported Topsoil have been established under rough grading. Do not spread Imported Topsoil prior to acceptance of sub-grade Work.
   2. Cultivation: Following Pre-Plant Weed Control operations, rip or cultivate verified planting areas of Native Site Soil at the indicated depth, prior to applying Imported Topsoil (if required) and Soil Amendments/Fertilizers.
      a. Depth of Cultivation: minimum Ten-inches (10”).

3. Following initial cultivation of existing Native Site Soil, evenly spread Imported Topsoil (if required) throughout all planting areas at the minimum indicated depth to meet finished landscape grades.
   a. Depth of Imported Topsoil: Minimum six-inches (6").
4. Once Imported Topsoil has been spread, uniformly broadcast all required Soil Amendments and Fertilizers indicated in Planting Soil Amendments Schedule (below) as amended through the results of the Agronomic Soil Fertility Report.
5. Thoroughly cultivate/blend all materials to provide a homogenous planting soil mixture at the indicated depth:
   a. Depth of Cultivation: Minimum Ten-inches (10").
6. Tamp/compact prepared Planting Soil as required to eliminate settlement, and complete finish grading operations per Section 312219 – Landscape Grading.
7. Planting Soil Amendment Schedule:

Soil Amendment/Fertilizer	*Ratio*
First Component of Soil Conditioner Blend: Bulk Composted Organic Soil Amendment	Four (4) cu. yds. / 1,000 square feet of planting area.
Second Component of Soil Conditioner Blend: Granular Soil Conditioning Material & Fertilizer	At indicated ratio, per selected Manufacturer.
Gypsum	200 pounds / 1,000 square feet.
Commercial Fertilizer	At indicated ratio, per selected Manufacturer.
Soil Sulfur	8 pounds / 1,000 square feet of planting area.
Iron (non-staining)	10 pounds / 1,000 square feet of planting area.

a. Modifications: The Planting Soil Amendment Schedule may be modified, based on the combined results of the Agronomic Soil Fertility Tests and Percolation Tests.
   1) Contractor shall be provided with fair and adequate compensation by the Owner should additions or increases to the specified ratios are required to the Planting Soil Amendment Schedule due to the Agronomic Soil Fertility Test results and/or recommendations by the Landscape Architect.
   2) Contractor shall provide the Owner fair and adequate credit should subtractions or decreases to the specified ratios are required to the Planting Soil Amendment Schedule due to the Agronomic Soil Fertility Test results and/or recommendations by the Landscape Architect.

8. Complete finish grading operations per Section 312219 – Landscape Grading.

6. APPLICATION RATES

A. Fertilizer Tablets shall be spread equidistantly around the perimeter within the Amended Planting Backfill Mixture, up to within three-inches (3") of the finished grade of the Mixture, and at the following rates:

Size of Plant Material	*Total Quantity of 7-gram Fertilizer Tablets*
Liner, Plug, Flat-Size Plant, or 4" Pot.	One (1) Tablet
One (1)-gallon Container stock.	Three (3) Tablets
Five (5)-gallon Container stock.	Nine (9) Tablets
Fifteen (15)-gallon container stock	Fifteen (15) Tablets
24" Box Container Stock	Sixteen (16) Tablets
30" Box Container Stock	Eighteen (18) Tablets
36" Box Container Stock	Twenty (20) Tablets
42" Box Container Stock	Twenty-two (22) Tablets
48" Box Container Stock	Twenty-four (24) Tablets
60" Box Container Stock	Thirty-six (36) Tablets
For Container Stock larger than 60" Box.	Six (6) Tablets for each ½" of tree caliper size.
For each 1'-0" of Palm Tree (apical meristem) height. (Example: a 25' Palm tree requires 50 tablets)	Two (2) Tablets.

1. Contractor shall not provide Fertilizer Tablets for designated native plant species, as indicated in the Contract Drawings or as directed by the Landscape Architect. Contractor shall verify with the Landscape Architect, in writing, as to which plants are subject to not receive the Fertilizer Tablets.

B. Mycorrhizal Inoculum Application Rate:
1. During application of Fertilizer/Planting Tablets, Mycorrhizal Inoculum shall be spread equidistantly around the perimeter within the Amended Planting Backfill Mixture, up to within three (3") inches of the finished grade of the Mixture, at the prescribed application rate per the Manufacturer's written recommendations.

7. STRUCTURAL SOIL <<<VERIFY>>>

A. Sub-Grade: Excavating, trenching, and backfilling shall allow for the required design depth and width of the Structural Soil mix to be used. Sub-Grade shall be graded to provide for trench depths as required. Sub-Grade of areas designated as Structural Soil are to be prepared to 95% Modified Proctor Density and shall be free of stones, debris, root branches, toxic materials, building materials, and other deleterious materials not beneficial to sustain healthy plant growth. Sub-Grade is to slope to sub-surface drain lines where provided.

B. Sub-Surface Drainage: After preparation of Sub-Grade, install sub-surface drainage according to Contract Drawings and prior to installation of Structural Soil.

C. Mixing:
1. Mix Structural Soil on a paved surface using front end loaders, or at material product supplier factory. Typically the stone is spread in a layer, the dry hydrogel is spread evenly on top and the screened moist growing medium is the top layer. The entire pile is turned and mixed until a uniform blend is produced.
2. Over-handling of Structural Soil can result in separation of growing medium from the aggregates.

D. Placement:
1. Structural Soil should be moist but not saturated with water when placed.
2. Install and compact Structural Soil designated locations at a maximum of six-inch (6") lifts.
3. Structural Soil shall be compacted as required to achieve the equivalent of 95% Modified Proctor Density.

8. DRAINAGE OF PLANTING AREAS

A. Surface Drainage:
1. Discrepancies: Provide proper surface drainage of planted areas. Submit in writing all discrepancies in the Contract Drawings or Specifications, or prior Work done by others, which Contractor feels precludes establishing proper drainage.
2. Correction: Include description of work required for correction or relief of said condition.

B. Detrimental Drainage, Soils and Obstructions:
   1. Notification: Submit in writing all soils or drainage conditions considered detrimental to growth of plant materials. State condition and submit proposal and cost estimate for correcting condition.
   2. Correction: Submit for acceptance a written proposal and cost estimate for the correction before proceeding with Work.
   3. Obstructions: If rock, underground construction Work, tree roots, or other obstructions are encountered in the performance of Work under this Section, submit cost required to remove the obstructions to a depth of not less than six-inches (6") below the required soil depth.

9. CLEAN UP AND PROTECTION

A. For Work under this Section, keep Work area in a clean, orderly, and safe condition. Contractor shall remove trash caused from his Work on a weekly basis throughout the duration of the Work.

B. Protect site from damage due to landscape operations, operations by other Contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged Soil Preparation areas as directed.

C. Upon completion of his Work under this Section, the Contractor shall remove rubbish, waste, debris, excess construction materials, and other items resulting from construction operations offsite as described herein this Section, as directed by the Landscape Architect.

END OF SECTION 329113 – SOIL PREPARATION

SECTION 329300
EXTERIOR PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete Exterior Landscape Planting installation, as shown in the Contract Drawings, and as specified herein this Section.

B. Work under this section consists of, but is not necessarily limited to, furnishing and installing the following:
   1. Trees
   2. Shrubs
   3. Ornamental Grasses
   4. Groundcovers
   5. Cacti, Succulents, etc.

C. Related Sections: The following Sections contain requirements that relate to Work in this Section:
   1. Section 31 22 19 – Landscape Grading.
   2. Section 32 84 00 – Irrigation Systems.
   3. Section 32 91 13 – Soil Preparation.
   4. Section 32 92 00 – Lawns and Grasses.
   5. Section 32 94 00 – Landscape Planting Accessories.
   6. Section 32 98 13 – Landscape Establishment Period.

1.2 DEFINITIONS AND APPLICABLE STANDARDS

A. References:
   1. ASTM – American Society for Testing Materials.
   2. USDA – United States Department of Agriculture.
   3. ANSI – American National Standards Institute.

B. Reference Standards:
   1. *An Annotated Checklist of Woody Ornamental Plants of California, Oregon, and Washington,* (Number 4091), McClintock and Leiser, Division of Agricultural Sciences, University of California, 1979.
   2. *American National Standard for Nursery Stock (ANSI Z60.1).* American National Standards Institute, and American Association of Nurserymen, Latest edition,
   3. *American Joint Committee on Horticultural Nomenclature*, 1942 Edition of Standardized Plant Names.
   4. *Hortus III*, 1976 Edition, Liberty Hyde Bailey Hortorium, Cornell University.
   5. *The Hillier Gardener's Guide to Trees and Shrubs*, 4th Edition, 1978.

6. *Manual of Cultivated Conifers*, Den Ouden & Boon, 1978.
7. *Datascape Guide to Commercial Nomenclature*, American Nurserymen Publishing Co., Chicago, IL, 1994.
8. *American National Standard for Tree Care Operation, Tree, Shrub, and Other Woody Plant Maintenance (ANSI A300),* American National Standards Institute, Latest Edition.

C. Definitions:
1. *Plant Material(s)* – Refers to living plant species, inclusive of trees, shrubs, groundcovers, vines, ornamental grasses, cacti/succulents, espaliers, annuals, perennials, etc., as indicated in the Contract Drawings.
2. *Planting Area (PA)* – As denoted on the Contract Drawings, shall refer to areas to be installed with Plant Material(s), or areas where existing vegetation shall be protected.
3. *Plant Height* – Measurement of main body height, not measurement to branch tip.
4. *Plant Spread* – Measurement of main body diameter, not measurement from branch tip to branch tip.
5. *Amended Planting Backfill Mixture* – Refer to Section 329113 – Soil Preparation.
6. *Balled and Burlapped Stock* – Healthy, vigorous exterior plants with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.
7. *Balled and Potted Stock* – Healthy, vigorous exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.
8. *Bare-Root Stock* – Healthy, vigorous exterior plants grown with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of exterior plant required.
9. *Clump* – Where three or more young trees were planted in a group and have grown together as a single tree having three or more main stems or trunks.
10. *Container-Grown Stock* – Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of exterior plant required.
11. *Fabric Bag-Grown Stock* – Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.
12. *Finish Grade* – Elevation of finished surface of planting soil.

13. *Manufactured Topsoil* – Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
14. *Multi-Stem* – Where three (3) or more main stems arise from the ground from a single root crown or at a point right above the root crown.
15. *Sub-grade* – Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
16. *Subsoil* – All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

D. Measurements:
1. sq/ft: Measurement, in square-foot.
2. O.C.: Measurement used for On-Center spacing.

1.3 SUBMITTALS

A. General: Submit each item in this Article in four (4) bound Submittal Booklets.

B. Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other identification methods) and legible information on the following landscape information indicated in this Article:
1. Alphabetized List of Plant Material.

(Provide Color Photograph of Plant Material here) (Note: Photograph shall include a person, tape measurer, or other scaled reference).

Project Name:	
Botanical Name:	
Common Name:	
Form (Multi, Standard, etc.):	

Container Size (as applicable:)	
Overall Height (provide Apical Meristem Height for Palms):	
Spread:	
Caliper (as applicable):	
Quantity Required (per Contract Drawings):	
Quantity Available (at supplying Nursery):	
Supplying Nursery Name:	
Contact Name at Nursery:	
Nursery Address:	
Nursery Phone Number:	
Date of Nursery Photo:	
Comments/Remarks:	

2. Description of Plant Material, for each species indicated in the Contract Drawings, submitted in the following format:
3. The Alphabetized List of Plant Material and Description of Plant Material shall not be construed as to acceptance of the Plant Material. All Plant Material shall be subject to review and approval by the Landscape Architect upon delivery to the Project Site.

C. Qualification data for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.

D. Planting installation schedule, indicating anticipated locations and dates for each type of planting.

E. Submittals under this Article will be rejected without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if the required information is missing or not presented in the format as requested.

F. No Work shall proceed under this Section until Submittal requirements indicated herein have been reviewed accordingly by the Landscape Architect.

1.4 QUALITY ASSURANCE AND CONTROL

A. Installer Qualifications:
   1. Requirement: Valid California C-27 (Landscaping Contractor) License.
   2. Engage an experienced Installer who has demonstrated completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
   3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping installations under this Section are in progress.

B. Plant Material: Provide quality, size, genus, species, and variety of Plant Material indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."
   1. Selection of Plant Material purchased under allowances will be made by the Owner, who has the option to tag Plant Material stock at their place of growth before they are prepared for transplanting.
   2. At least one (1) plant of each Plant Material species delivered to the Project Site shall have an identification tag from supplying nursery showing botanical and common name of the plant as identified in the Contract Drawings. Landscape Architect shall be provided the opportunity for an on-site debriefing by the Contractor that identifies the size and specific type of Plant Material upon delivery.
   3. Incorrect Planting Materials:
      a. Replace, at no cost to Owner, Plant Material that is revealed during the course of the Contract as to being untrue to the species indicated in the Contract Drawings and reviewed accordingly under this Section.
      b. Provide replacements equal to the size and quality to match the planted materials at the time the untrue species is discovered.
   4. Replacement of Plant Material: Refer to the Guarantee Article indicated herein this Section.

C. Observation: Landscape Architect may observe Plant Materials at either their place of growth or at the site before or after planting, for compliance with requirements for genus, species, variety, size and quality. Landscape Architect also retains right to observe Plant Material further for size and condition of root balls, trunks, branches, and crowns; insects; pests; disease; weeds; injuries, and latent defects. Landscape Architect reserves the right to reject unsatisfactory and/or defective Plant Material at any time during progress of Work. Contractor shall remove rejected Plant Material immediately from Project site.

D. Regulatory Requirements:

1. Contractor shall meet the requirements of applicable laws, codes, and regulations as required by the authorities having jurisdiction over the Work.
2. Provide for inspections and permits by Federal, State, and Local authorities in furnishing, transporting, and installing materials.

E. Permits, Fees, Bonds, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, and inspections necessary to perform and complete Work under this Section.

F. Plant Material Review and Selection (Tagging):
1. At the discretion of the Landscape Architect, Plant Material will be subject to review, photographed, and selected/tagged by the Landscape Architect at the nursery, or other place of growth, prior to delivery to the Project Site. Contractor shall verify with the Landscape Architect if tagging operations are required.
2. Selecting/Tagging of Plant Materials at the nursery or place of growth does not cancel the right of the Landscape Architect to reject Plant Materials at the Project Site, if damaged or unacceptable conditions are found that were not detected at the nursery, place of growth, or in the submitted photographs.

G. Plant Material Delivery: Plant Material shall be delivered with original Plant Material tagging materials set in place, as selected and marked by the Landscape Architect at the nursery or place of growth. Contractor shall notify Landscape Architect upon deliver of Plant Material for review of stock and tagging materials. Plant Materials delivered without original tagging materials, or with broken, damaged, or altered tagging materials, shall be subject to rejection by the Landscape Architect. Rejected Plant Material shall be removed immediately.

H. Pre-installation Conference: Conduct conference at Project Site to comply with requirements of Division 1 Section "Project Meetings".

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Do not prune Plant Material before delivery, except as approved by the Landscape Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie Plant Material in such a manner as to destroy natural shape.
1. Immediately after digging field-grown Plant Materials, pack root systems in wet straw, hay, burlap, or other suitable material to keep root system moist until final planting installation.
2. Deliver freshly dug field-grown Plant Materials with firm, natural balls of earth of sufficient depth to include fibrous and feeding roots, meeting or exceeding requirements of ANSI Z60.1 for root ball diameter.

B. Handling Plant Materials:
1. Handle balled and burlap Plant Material stock by the root ball.

2. Handle container-grown Plant Materials only by their containers.
3. DO NOT handle Plant Materials by their trunks or stems.
4. DO NOT drop any Plant Materials.
5. DO NOT bind or handle Plant Materials with wire or rope.
6. Pad trunk and branches of Plant Materials whenever using hoisting cables, chains, or straps.
7. Should the Contractor engage in handling any Plant Material(s) by any unacceptable method(s), the Landscape Architect shall reserve the right to reject any of the mishandled Plant Material(s). The Contractor shall replace rejected Plant Material(s) with approved Plant Material(s), at no additional cost to the Owner.

C. Delivery: Provide protective covering during delivery. Deliver Plant Material only after preparations for planting have been completed and install immediately. If planting is delayed more than six (6) hours after delivery, set Plant Materials in shade, protect from weather and mechanical damage, and keep roots moist. Anchor plants to prevent damage from winds.
1. Heel-in bare-root Plant Material stock. Soak roots in water for two (2) hours prior to planting.
2. Set balled Plant Material stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. DO NOT remove container-grown Plant Material stock from containers before time of planting.
4. Water root systems of Plant Material stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.6 COORDINATION, SCHEDULING, AND OBSERVATIONS

A. Acceptance: Do not install Plant Materials prior to acceptance of finish grades and installation of irrigation system.

B. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

C. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease planting operations and notify Landscape Architect for further direction.

D. Construction Site Observations: Landscape Architect may observe installation Work herein this Section at Project Site for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe installation of products and materials for defects and to reject unsatisfactory or defective product, material, or installation at any time during progress of Work. Contractor shall remove rejected Work immediately from Project site. The Contractor shall request, in writing, at least

one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

1.7 PROJECT SITE CONDITIONS

A. General: Installation of Plant Materials shall be performed only during the time of day and during seasons when satisfactory results can be expected, unless authorized by the Landscape Architect.

B. Climate Restrictions: Do not install Plant Materials during rainy or inclement weather.

1.8 SUBSTITUTIONS

A. Consideration: Plant Materials to be considered equal to the Plant Materials indicated herein this Section shall be reviewed by the Landscape Architect. Plant Materials with equal performance characteristics may be considered, providing deviations in dimensional size, color, composition, operation, and/or other characteristics do not change the design concept, aesthetic appearance, or intended performance, as solely judged by the Landscape Architect. The burden of proof on product equality is on the Contractor.
   1. Substituted Plant Materials shall be true to species and variety and shall conform to measurements specified, except that plants larger than specified may be used if accepted. If larger Plant Materials are accepted, increase the ball of earth in proportion to the size of the plant, as required. Plant Materials overgrown for their container size will be rejected.

B. Specific reference to Manufacturer's names and products specified herein are used as standards of quality. This implies no right to the Contractor to substitute other materials without prior written approval by the Landscape Architect for Work under this Section.

C. Plant Materials substituted and installed by the Contractor, without prior written approval by the Landscape Architect, may be rejected. Contractor shall not be entitled to be compensated by the Owner where the Contractor has installed rejected substitutions without receiving prior written approval.

D. Contract Price: Substituted Plant Materials under this Section shall not increase the Contract price.

1.9 WARRANTY

A. General: The Warranty indicated herein in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract, and shall be in addition to, and run concurrent with, other guarantees or warranties made by the Contractor under requirements of the Contract Documents.

B. Warranty: Contractor shall warrant living Plant Materials under this Section for a period of one (1) year after date of Substantial Completion. Warrant against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by the Owner; abnormal weather conditions unusual for the Warranty Period; or incidents which are beyond the Contractor's control.

C. Replacement of Plant Material:
   1. Replace Plant Materials exhibiting conditions which are determined to be unacceptable due to workmanship by the Contractor, at no cost to the Owner, per the direction of the Landscape Architect.
   2. Remove and replace dead or dying Plant Material immediately unless required to plant in the succeeding planting season.
   3. Contractor shall be held responsible for a maximum of two (2) replacement of each failed Plant Material after Final Acceptance during the Warranty Period.
      a. Closely match replacements to adjacent specimens of the same species. Apply requirements of this Specification to replacements.

1.10 FINAL ACCEPTANCE AND LANDSCAPE ESTABLISHMENT PERIOD

A. Refer to Section 32 98 13 – Landscape Establishment Period.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PLANT MATERIAL

A. Immediately upon award of Contract for Work in this Section, the Contractor shall locate and purchase or hold for purchase plant material as required.
   1. Contractor shall verify with Landscape Architect of Plant Material that has been nursery “contract grown” by the Owner for use of Work under this Contract.
   2. Contractor shall review the condition of the Plant Material with Landscape Architect at the nursery maintaining the Plant Material prior to delivery, and when delivered to the Project Site.

B. Quality: Plant Materials shall have a growth habit typical for each variety and species indicated in the Plant List (as detailed on the Contract Drawings).
   1. All Plant Materials shall be superior grade nursery stock, symmetrical, with tightly knit branching, so trained or favored in development and appearance in form, number of branches, compactness and symmetry, healthy, and vigorous in growth, as reviewed and determined by the Landscape Architect.
   2. Plant Materials shall be free from insect pests, eggs and larvae, plant diseases, sun scalds, fresh bark abrasions, excessive abrasions, windburn, salt burn, weeds, or other disfigurements or conditions, as reviewed and determined by the Landscape Architect.

3. Plant Material shall be subject per the California State Department of Agriculture's Regulations for Nursery Inspections of Rules and Grading.
4. Growing Conditions: Plant Materials shall be nursery-grown in accordance with good horticultural practices under climatic conditions similar to those of project unless otherwise specifically authorized.

C. Container Stock (excluding annuals) shall be grown in boxes or containers in which delivered for at least one (1) growing season, but not over two (2) years. Plant Material grown in boxes or containers shall be cultivated during this time to permit full rooting within the specified box or container to bind the planting soil, but not so long as to create a "root-bound" condition.
   1. Plant Material shall be completely free of circling, kinked or girdling trunk surface and center roots, and show no evidence of a pot-bound condition.
   2. No boxed nor container Plant Material shall be planted which have cracked or broken balls of earth when separated from their boxes or containers.
   3. No Plant Material shall be planted with damaged roots, broken root balls, or which are found to be "root-bound" when separated from their containers.

D. Pruning:
   1. Do not prune Plant Materials unless directed by the Landscape Architect.
   2. Pruning of Plant Material as grown at the nursery shall conform to ANSI A300 standards.
   3. Consult with Landscape Architect for pruning Plant Materials after delivery and installation.

E. Measurements: Measure Plant Material according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes.
   1. Take caliper measurement at a point on the trunk six-inches (6") above natural ground line for trees up to four-inches (4") in caliper (at a point twelve-inches (12") above the natural ground line for trees over four-inches (4") in caliper).
      a. Measure foliage across mean foliage dimension when branches are in their normal upright position.
      b. For trees to be supplied in "raised up" condition, foliage origin along main trunk shall be measured from soil line after installation.
      c. Height and spread dimensions specified refer to main body of plant and not branch tip to tip. Properly trimmed plants shall measure the same in any direction. If a plant is unevenly grown, it shall be classified in the size category of the smallest dimension.
   2. Size Range: If a range of size is given, do not use Plant Materials less than the minimum size. The measurements specified are the minimum size acceptable and are the measurements after pruning, where pruning is required. Plant Materials that meet the measurements specified, but do not possess a normal balance between height and spread shall be rejected.

F. Field Dug Stock: Prior to digging of field-grown Plant Materials, insure that excess loose fill resulting from cultivation around trunks/stems and over roots be removed down to natural finish grade at crown of Plant Materials. During digging, verify that

size of tree spade or other equipment is adequate to encompass the actively growing root zone of all Plant Materials. Plant Materials which, after digging, show mostly large fleshy roots and few fibrous roots, will be rejected.

G. Condition of Root Systems: Plant Materials must prove to be completely free of circling, kinked or girdling trunk surface and center roots and show no evidence of a root-bound condition. Upon inspection by Landscape Architect at the job site, if five-percent (5%) or more of the plants of each species are found to contain kinked, circling or girdling roots, all plants of that species shall be rejected.

H. Unacceptable Trees: Trees that have damaged, broken, pruned, or crooked leaders will be rejected. Trees having a main leader shall not have been headed back. Trees with abrasions of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over 3/4 in. which have not completely callused will be rejected.

2.2 SHADE AND FLOWERING TREES

A. Shade and Flowering Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required, subject to review and acceptance by the Landscape Architect. Container-grown trees will be acceptable and shall be subject to meeting ANSI Z60.1 limitations for container stock.
   1. Branching Height: 1/2 of tree height, unless otherwise indicated on Contract Drawings.

B. Small Trees: Small upright or spreading type, branched or pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1, subject to review and acceptance by the Landscape Architect. Container-grown trees will be acceptable and shall be subject to meeting ANSI Z60.1 limitations for container stock.
   1. Form: As indicated on the Contract Drawings for individual selected species.

2.3 SHRUBS

A. Form and Size: Shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of Shrub, subject to review and acceptance by the Landscape Architect. Container-grown Shrubs will be acceptable in lieu of balled and burlapped.
   1. Container-grown Shrubs shall be subject to meeting ANSI Z60.1 limitations for container stock, and other requirements as indicated on the Contract Drawings.

2.4 ORNAMENTAL GRASSES

A. Form and Size: Normal-quality, established, full, well-balanced, well-rooted, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.

B. 1. Container-grown stock shall be subject to meeting ANSI Z60.1 limitations for container stock.

2.5 GROUNDCOVERS

A. Provide ground covers full, established, and well-rooted in removable flats, containers, or integral peat pots, and with not less than the minimum number and length of runners required by ANSI Z60.1 for the container size indicated, and other requirements as indicated on the Contract Drawings, subject to review and acceptance by the Landscape Architect.

2.6 CACTI/SUCCULENTS

A. Form and Size: Superior-quality, established, full, symmetrical, well-balanced, well-rooted, of type, height, spread, and shape required, subject to review and acceptance by the Landscape Architect.
   1. Container-grown stock shall be subject to meeting ANSI Z60.1 limitations for container stock.

PART 3 - EXECUTION

3.1 EXAMINATION

A. NO WORK UNDER THIS SECTION SHALL COMMENCE UNTIL SUBMITTALS UNDER THIS SECTION HAVE BEEN REVIEWED ACCORDINGLY BY THE LANDSCAPE ARCHITECT.

B. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.

C. Installation practices of the Plant Materials shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted horticultural practices, as judged by the Landscape Architect.
   1. Soil moisture levels prior to planting shall be no less than seventy-five-percent (75%) of field capacity. The determination of adequate soil moisture for planting shall be in the sole judgment of the Landscape Architect, and their decision shall be final.

a. If the soil moisture level is found to be insufficient for planting installation, planting pits shall be filled with water and allowed to drain before commencing planting operations.
b. Any planting area that may become compacted in excess of eighty-five-percent (85%) relative compaction (due to construction operations or other activities during the Contract) shall be tilled and thoroughly cross-ripped to a minimum depth of nine-inches (9") to alleviate the condition, taking care to avoid all existing subsurface utilities, drainage, etc.
c. Do not commence planting installation prior to acceptance of Section 329113 – Soil Preparation.

D. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the landscape installation.

E. Preparation of Planting Installation: Lay out individual Plant Material locations and areas for multiple plantings. Stake locations, outline areas, and gain the Landscape Architect's acceptance prior to commencing physical planting installation. Contractor shall make minor adjustments to the planting layout as required, per the direction of the Landscape Architect.

F. No more Plant Materials shall be distributed in the planting area on any day than can be installed and watered on that day. Plant Materials shall be planted and watered immediately after the removal of their containers, as applicable.

G. Contractor shall protect existing and new improvements and systems installed prior to planting installation. Maintain protection in place until completion of Work and Landscape Establishment Period.

H. Finish Grades for planting areas shall have been established (per Section 31 22 19 – Landscape Grading) prior to Work under this Section. Verify that grades are within one-inch plus or minus (1"+/-) of the required finish grade, and that all proper soil amendments and fertilizers have been furnished and installed accordingly as specified (per Section 32 91 13 – Soil Preparation).
1. Maintain positive surface drainage of all planted areas throughout the duration of the Contract.

I. Pre-Planting: Where Plant Materials are to be pre-planted to permit site improvements to be installed around them, Contractor shall be responsible for the accurate layout and placement of those Plant Materials, as measured to their centerlines. Confirm designated pre-planting operations with Landscape Architect prior to commencing Work. Contractor shall also be responsible for the protection of pre-planted Plant Materials while other Work is taking place around them. Provide regular irrigation, as necessary, prior to installation and functioning of irrigation systems (per Section 328400 – Irrigation Systems).

3.2 EXCAVATION FOR PLANT MATERIAL

A. General: Upon completion of applicable pre-planting soil preparation requirements indicated in Section 32 91 13 – Soil Preparation, excavate planting hole(s) for Plant Material with scarified vertical sides, with the bottom of the excavated hole slightly raised and compacted at the center to assist drainage and to minimize settlement of the Plant Material. Excavate holes according to the spacing alignment (i.e. hedge spacing, grid spacing, triangular spacing, etc.) and the on-center (O.C.) spacing intervals (i.e. 24" O.C. etc.) indicated on the Contract Drawings. Loosen any hard subsoil in the bottom of the excavation where evident, and remove all rocks greater than one-half-inch (1/2") in diameter, trash, debris, etc. Retain the excavated soil for use as part of the Amended Planting Backfill Mixture (as indicated in Section 329113 – Soil Preparation).

1. Bare-Root Plant Material:
    a. Excavate at least twenty-four-inches (24") wider than the perimeter of the bare root spread, and deep enough to allow setting of the roots on a compacted layer of native planting soil, where the top of the plant's root collar is one-inch (1") higher than finished grade or as further directed by the Landscape Architect:
    b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6") depth of native planting soil.
    c. Where Tree Root Aeration Units are indicated (per Section 329400 – Landscape Planting Accessories), provide further excavation in the planting hole by auger to the required minimum depth allowing for installation of the Tree Root Aeration Unit assembly.
2. Balled and Burlap Plant Material:
    a. Excavate the planting hole to the width and depth indicated in the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant's root collar is one-inch (1") higher than finished grade or as further directed by the Landscape Architect:
    b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6") depth of native planting soil.
    c. Where Tree Root Aeration Unit(s) are indicated (per Section 329400 – Landscape Planting Accessories provide further excavation in the planting hole by auger to the required minimum depth allowing for installation of the Tree Root Aeration Unit assembly.
3. Container-Grown Plant Material:
    a. Excavate the planting hole to the width and depth indicated on the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant's root collar is one-inch (1") higher than finished grade or as further directed by the Landscape Architect:
    b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6") depth of native planting soil.
    c. Where Tree Root Aeration Unit(s) are indicated, (per Section 329400 – Landscape Planting Accessories), provide further excavation in the planting hole by auger to the required minimum depth for installation of the Tree Root Aeration Unit assembly.

4. Field Grown/Specimen Trees:
    a. Excavate the planting hole to the width and depth indicated on the Contract Drawings. Depth of the planting hole includes the depth indicated for the compacted setting layer at the bottom of the excavation, where the top of the plant's root collar is one-inch (1") higher than finished grade or as further directed by the Landscape Architect:
    b. Compacted Setting Layer: Provide a crown of a minimum six-inch (6") depth of native planting soil.
    c. Where Tree Root Aeration Unit(s) are indicated (per Section 329400 – Landscape Planting Accessories), provide further excavation in the planting hole by auger to the required minimum depth for installation of the Tree Root Aeration Unit assembly.
    d. In areas where special subsurface drainage for planting is indicated, tie drainage pipes, as required, into the drain system.
    e. Excavate planting hole at 3x the diameter of the rootball.

B. Obstructions: Notify the Landscape Architect immediately if unexpected rock, debris, contaminants, obstructions, or other items that are detrimental to the healthy sustained growth of Plant Material is encountered in the excavation process.
    1. Hardpan Layer: If encountered, drill six-inch (6") diameter holes into free-draining strata or to a depth of ten-feet (10'), whichever is less, and backfill with free-draining material.

C. Drainage: Notify the Landscape Architect if subsoil conditions show evidence of unexpected water seepage or retention in planting holes.

3.3 PLANTING PLANT MATERIAL

A. Bare Root Plant Material: Set Bare Root Plant Material plumb and in center of the excavated hole, with top of root ball set properly at the adjacent finish grade as indicated. Set Bare Root Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.
    1. Thoroughly soak the roots of the Bare Root Plant Material in clean water for a minimum of twelve (12) hours but no more than twenty-four (24) hours to fully hydrate the root mass. Do not soak above the root crown.
    2. Remove wood shavings or other material used to keep the exposed root mass in a moist condition.
    3. Carefully place the Plant Material stock on the specified setting layer of compacted native soil, with the top of root mass set approximately one-inch (1") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide an orientation of the Plant Material that is confirmed and acceptable by the Landscape Architect. During the process of determining an acceptable orientation of the Plant Material, carefully handle the Plant Material by its trunk.

4. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing/blending the following:
   a. ¼ yard of Bulk Composted Organic Soil Amendment Material (per Section 32 91 13 – Soil Preparation).
   b. ½ pound of Granular Soil Conditioning Material & Fertilizer (per Section 32 91 13 – Soil Preparation).
   c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 32 91 13 – Soil Preparation), per the Manufacturer's latest printed instructions.
      1) Pending the results of the Agronomic Soil Fertility Report, the Amended Planting Backfill Mixture may be modified accordingly to include additional soil amendments or fertilizers (gypsum, iron, potash, etc.) or the ratios as indicated in the Mixture indicated above may be modified.
         a) The cost of providing modifications to the Amended Planting Soil Backfill Mixture (as recommended through the Agronomic Soil Fertility Report and as directed by the Landscape Architect) shall be borne by the Contractor.
5. Install the Tree Root Aeration Unit(s) prior to backfilling operations, as required (per Section 32 94 00 – Landscape Planting Accessories).
6. Backfilling the excavated planting hole:
   a. Place the Amended Planting Backfill Mixture around the Plant Material root mass in the excavated planting hole. Place the Mixture in six-inch (6") lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets.
   b. Maintain the Plant Material plumb while working the Mixture around the root mass. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
   c. Add the Fertilizer Tablets and other amendments, (per Section 329113 – Soil Preparation) as required, at the prescribed application rates (as indicated per Section 32 91 13 – Soil Preparation) or if not indicated, per the Manufacturer's latest printed instructions.
   d. Place the final layers of the Amended Planting Backfill Mixture, tamping accordingly, to the top of the root mass.
   e. Dish and tamp top of the Mixture to form a three-inch (3") deep watering basin centered on the Plant Material's trunk to the rim width of the planting hole.
   f. Thoroughly mix together water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture (per Section 32 94 00 – Landscape Planting Accessories). Apply liquid matrix in sufficient quantity to thoroughly saturate the basin to settle the Mixture, and to eliminate voids and air pockets. Should any portions of the root mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.
7. Mulching: Apply mulch in watering basins as indicated on the Contract Drawings. Refer to Section 32 94 00) – Landscape Planting Accessories for type and requirements.

B. Balled and Burlapped Plant Material: Set the Balled and Burlapped Plant Material plumb and in center of the excavated hole, with top of the root ball raised above adjacent finish grade as indicated. Set Balled and Burlapped Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.
   1. Carefully place the Balled and Burlapped Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set one-inch (1") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation of the Plant Material, handle the Plant Material by its root ball; avoid handling the Plant Material by its trunk.
   2. Once orientation is accepted, carefully remove the burlap and wire baskets from the tops of the root ball and partially from the sides, but do not remove from under the root ball. Do not damage the root ball or any part of the plant. Plant Material shall be rejected if the root ball is cracked or broken before or during the planting operation.
   3. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing/blending the following:
      a. ¼ yard of Bulk Composted Organic Soil Amendment Material (per Section 32 91 13 – Soil Preparation).
      b. ½ pound of Granular Soil Conditioning Material & Fertilizer (per Section 32 91 13 – Soil Preparation).
      c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 32 91 13 – Soil Preparation), per the Manufacturer's latest printed instructions.
         1) Pending the results of the Agronomic Soil Fertility Report, the Amended Planting Backfill Mixture may be modified accordingly to include additional soil amendments or fertilizers (gypsum, iron, potash, etc.) or the ratios as indicated in the Mixture indicated above may be modified.
            a) The cost of providing modifications to the Amended Planting Soil Backfill Mixture (as recommended through the Agronomic Soil Fertility Report and as directed by the Landscape Architect) shall be borne by the Contractor.
   4. Install the Tree Root Aeration Unit(s) prior to backfilling operations, as required (per Section 32 94 00 – Landscape Planting Accessories.
   5. Backfilling the excavated planting hole:
      a. Place the Amended Planting Backfill Mixture around the root ball in the excavated planting hole. Place the Mixture in six-inch (6") lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets.
      b. Maintain the plant plumb while working the Mixture around the root ball. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.

c. Add the Fertilizer Tablets and other amendments, (per Section 32 91 13 – Soil Preparation) as required, at the prescribed application rates indicated herein this Article or if not indicated, per the Manufacturer's instructions.
d. Place the final layers of the Mixture, tamping accordingly, to the top of the root ball. Do not place the Mixture on top of the root ball.
e. Dish and tamp top of the Mixture to form a three-inch (3") deep watering basin centered on the Plant Material's trunk to the rim width of the planting hole. Do not cover the top of the root ball with the backfill mixture.
f. Thoroughly mix together water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture (per Section 32 94 00 – Landscape Planting Accessories). Apply liquid matrix in sufficient quantity to thoroughly saturate the basin to settle the Mixture, and to eliminate voids and air pockets. Should any portions of the root mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.

6. Mulching: Apply mulch in watering basins as indicated on the Contract Drawings. Refer to Section 32 94 00 – Landscape Planting Accessories for type and requirements.

C. Container-Grown Plant Material: Set Container-Grown Plant Material plumb and in the center of the excavated planting hole, with top of the root ball raised above adjacent finish grade as indicated. Set Container-Grown Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.

1. For plastic container stock (4" pot, 1-gallon, 5-gallon, 15-gallon, etc.), carefully remove the plant container prior to setting the plant in the excavated hole so as not to damage root ball. Tip container to horizontal position and shake carefully to remove Plant Material. Support root ball during installation to prevent cracking or shedding of soil.
2. Set the Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set one-inch (1") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation of the plant material, carefully handle the Plant Material by its container; avoid handling the Plant Material by its trunk.
   a. Plant Material with a damaged root ball upon removal of the container, or if the root ball fails to thoroughly hold the soil as it is removed from the container, or if the plant is mishandled or damaged during planting operations, shall be rejected.
3. For wooden boxed container stock, carefully set whole boxed container of the Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set one-inch (1") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation, carefully handle the Plant Material by its container; avoid handling

the Plant Material by its trunk or branches. Once orientation is accepted, remove the steel strapping and the sides of the wooden container so as not to damage the root ball or any part of the plant. Do not remove the bottom of the wooden container. Discard sides.

a. Plant Material with a damaged root ball upon removal of the container, or if the root ball fails to thoroughly hold the soil as it is removed from the container, or if the plant is mishandled or damaged during planting operations, shall be rejected.

4. Scarification: After removing container from plant, scarify the sides of the root ball to a depth of one-inch (1") at four (4) to six (6) equally-spaced locations around the perimeter of the root ball or at twelve-inch (12") intervals on sides of wooden boxed container stock. Cut and remove circling roots over 3/8 in. diameter.
5. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing/blending the following:
   a. ¼ yard of Bulk Composted Organic Soil Amendment Material (per Section 32 91 13 – Soil Preparation).
   b. ½ pound of Granular Soil Conditioning Material & Fertilizer (per Section 32 91 13 – Soil Preparation).
   c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 32 91 13 – Soil Preparation), per the Manufacturer's latest printed instructions.
      1) Pending the results of the Agronomic Soil Fertility Report, the Amended Planting Backfill Mixture may be modified accordingly to include additional soil amendments or fertilizers (gypsum, iron, potash, etc.) or the ratios as indicated in the Mixture indicated above may be modified.
         a) The cost of providing modifications to the Amended Planting Soil Backfill Mixture (as recommended through the Agronomic Soil Fertility Report and as directed by the Landscape Architect) shall be borne by the Contractor.
6. Install the Tree Root Aeration Unit(s) prior to backfilling operations, as required (per Section 32 94 00 – Landscape Planting Accessories).
7. In areas where indicated on the Contract Drawings, install the Deep Watering Bubblers as part of the irrigation system.
8. Backfilling the excavated planting hole:
   a. Place the Amended Planting Backfill Mixture around the root ball in the excavated planting hole. Place the Mixture in six-inch (6") lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets. Foot tamp the backfill, as required.
   b. Maintain the plant plumb while working the Mixture around the root ball. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
   c. Add the Fertilizer Tablets and other amendments (per Section 32 91 13 – Soil Preparation) as required, at the prescribed application rates indicated herein this Article or if not indicated, per the Manufacturer's instructions.

d. Place the final layers of the Mixture, tamping accordingly, to the top of the root ball. Do not place the Mixture on top of the root ball.
e. Dish and tamp top of the Mixture to form a three-inch (3") deep watering basin centered on the Plant Material's trunk to the rim width of the planting hole. Do not cover the top of the root ball with the backfill mixture.
f. Thoroughly mix together water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture (per Section 32 94 00 – Landscape Planting Accessories). Apply liquid matrix in sufficient quantity to thoroughly saturate the basin to settle the Mixture, and to eliminate voids and air pockets. Should any portions of the root mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.

9. Mulching: Apply mulch in watering basins as indicated on the Contract Drawings. Refer to Section 32 94 00 – Landscape Planting Accessories for type and requirements.

D. Field-Dug Specimen Plant Material: Set Field-Dug Specimen Plant Material plumb and in the center of the excavated planting hole, with top of the root ball raised above adjacent finish grades as indicated. Set Field-Dug Specimen Plant Material in the proper spacing and/or alignment(s) as indicated on the Contract Documents, or as further directed at the Project Site by the Landscape Architect.

1. After excavation of the planting hole, provide subsurface piping drainage and/or Tree Root Aeration Units as indicated on the Contract Drawings. Tie subsurface drainage into storm drainage system, where required. Install the Tree Root Aeration Units, where required.
2. Carefully set the Field-Dug Specimen Plant Material stock on the specified setting layer of compacted native soil, with the top of root ball set one-inch (1") above the finished grade to allow for settlement of the Plant Material within the excavated planting hole. Provide the orientation of the Plant Material that is confirmed and accepted by the Landscape Architect. During the process of determining an acceptable orientation of the Plant Material, carefully handle the Plant Material by a cradle around its root ball mass or by its planting container; avoid handling the Plant Material by its trunk.
   a. For Field-Dug Specimen Plant Material delivered in a wooden boxed container, do not remove sides or bottom of the container until the Specimen's orientation is accepted by the Landscape Architect. Once orientation is accepted, remove steel strapping and the sides of the wooden container so as not to damage the root ball or any part of the Specimen. Do not remove the bottom of the wooden container. Discard sides.
      1) Any Specimen with a damaged root ball upon removal of the container, or if the root ball fails to thoroughly hold the soil as it is removed from the container, or if the plant is mishandled or damaged during planting operations, shall be rejected.
3. Scarification: After removing container from plant, scarify the sides of the root ball to a depth of one-inch (1") at four (4) to six (6) equally-spaced locations around the perimeter of the root ball or at twelve-inch (12") intervals on sides

of wooden boxed container stock. Cut and remove circling roots over 3/8 in. diameter.

4. Prepare the Amended Planting Backfill Mixture: Amend each cubic yard (cu/yd) of native soil excavated from the planting hole by incorporating and thoroughly mixing and blending in the following:
    a. ¼ yard of Bulk Composted Organic Soil Amendment Material (per Section 32 91 13 – Soil Preparation).
    b. ½ pound of Granular Soil Conditioning Material & Fertilizer (per Section 32 91 13 – Soil Preparation).
    c. Add Mycorrhizal Inoculum to the excavated native soil, (per Section 32 91 13 – Soil Preparation), per the Manufacturer's latest printed instructions.
        1) Pending the results of the Agronomic Soil Fertility Report, the Amended Planting Backfill Mixture may be modified accordingly to include additional soil amendments or fertilizers (gypsum, iron, potash, etc.) or the ratios as indicated in the Mixture indicated above may be modified.
            a) The cost of providing modifications to the Amended Planting Soil Backfill Mixture (as recommended through the Agronomic Soil Fertility Report and as directed by the Landscape Architect) shall be borne by the Contractor.
5. In areas indicated on the Contract Drawings, install the Deep Watering Bubblers as part of the irrigation system (per Section 32 84 00 – Irrigation Systems).
6. Install the Tree Root Aeration Unit(s) prior to backfilling operations, as required (per Section 32 94 00 – Landscape Planting Accessories).
7. Backfilling the excavated planting hole.
    a. Place the Amended Planting Backfill Mixture around the root ball in the excavated planting hole. Place the Mixture in six-inch (6") lifts, tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets.
    b. Maintain the plant plumb while working the Mixture around the root ball. When the planting hole is approximately half-backfilled, water thoroughly before placing the remainder of the Mixture.
    c. Add the Fertilizer Tablets and other amendments, as required, at the prescribed application rates indicated herein this Article or if not indicated, per the Manufacturer's instructions.
    d. Place the final layers of the Mixture, tamping accordingly, to the top of the root ball. Do not place the Mixture on top of the root ball.
    e. Dish and tamp top of the Mixture to form a three-inch (3") deep watering basin centered on the Plant Material's trunk to the rim width of the planting hole.. Do not cover the top of the root ball with the backfill mixture.
    f. Thoroughly mix together water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture (per Section 32 94 00 – Landscape Planting Accessories). Apply liquid matrix in sufficient quantity to thoroughly saturate the basin to settle the Mixture, and to eliminate voids and air pockets. Should any portions of the root

mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.

8. Mulching: Apply mulch in watering basins as indicated on the Contract Drawings. Refer to Section 32 94 00 – Landscape Planting Accessories for type and requirements.

E. Plant Settling and Orientation: Plant Material that has settled deeper than the surrounding grade shall be excavated and raised to the correct level, to the satisfaction of the Landscape Architect. Plant Material installed without direction and/or approval as to its proper orientation shall be subject to excavation and acceptable orientation, to the satisfaction of the Landscape Architect.

F. Fertilizer Tablet(s) Application Rate: Refer to Section 32 91 13 – Soil Preparation.

3.4 PLANTING GROUND COVERS

A. General: Upon completion of applicable pre-planting soil preparation requirements indicated in Section 329113 – Soil Preparation, excavate planting hole(s) for Ground Covers with scarified vertical sides, with the bottom of the excavated hole slightly raised and compacted at the center to assist drainage and to minimize settlement of the Plant Material. Refer to requirements indicated in Part III of this Section for Excavation.

1. Plant Settling: Plant Material that has settled deeper than the surrounding grade shall be raised to the correct level.

B. Excavate holes according to the spacing alignment (i.e. triangular spacing, etc.) and the on-center (O.C.) spacing intervals (i.e. 24" O.C. etc.) indicated on the Contract Drawings. Loosen any hard subsoil in the bottom of the excavation where evident, and remove all rocks greater than one-half-inch (1/2") in diameter, trash, debris, etc.

C. Obstructions: Notify the Landscape Architect immediately if unexpected rock, debris, contaminants, obstructions, or other items that are detrimental to the healthy sustained growth of Plant Material is encountered in the excavation process.

D. Ground Covers: Follow applicable planting requirements per Articles 3.02 and 3.03 indicated herein this Section.

1. Carefully set root mass into excavated hole, spreading roots, and backfill with planting soil.
2. Add Fertilizer Tablets and other amendments, as required, within backfill.
3. Work soil around roots to eliminate air pockets, and provide a slight saucer indentation around plants to retain surface water.
4. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

3.5 INSTALLATION OF PLANTING CONTAINERS

A. Locate Planting Container(s) accordingly in the designated location(s) per the Contract Drawings.

B. Level and plumb Container(s) accordingly for drainage and irrigation, as required.

C. Cover bottom holes of Planting Container (if any) with Geotextile Filter Fabric, as required. Place at least a four-inch (4") layer of Drainage Rock in the bottom of the Planting Container. Cover top of Rock with Geotextile Filter Fabric, and continue up sides of Planting Container to within six-inches (6") of top of Container.

D. Install Tree Root Aeration Unit Assembly, as required.

E. Partially-fill the Planting Container with specified Planting Container Soil Mixture (per Section 329113 – Soil Preparation) in six-inch (6") lifts, as needed, and tamp accordingly to provide a relatively-firm setting layer of compacted Mixture, allowing for the top of Plant Material root ball to be set approximately one-inch (1") above the finished grade in the Planting Container, allowing for settlement of the Plant Material. Provide orientation and layout of Plant Material in the Container that is confirmed and accepted by the Landscape Architect.

F. Continue to place the Planting Container Soil Mixture in six-inch (6") lifts, carefully working around the root ball(s), and tamping each lift accordingly to settle the Mixture and eliminate voids and air pockets.
   1. Add the Fertilizer Tablets and other amendments, as required, at the prescribed application rates indicated herein this Article or if not indicated, per the Manufacturer's instructions, once the Container is half-filled with the Mixture.

G. Continue backfilling operations in lightly compacted layers to an elevation of one-inch (1") inch below the top of planter, allowing natural settlement. Do not place the Mixture on top of the root ball.
   1. Maintain the plant plumb while working the Mixture around the root ball.

H. Thoroughly mix together water and Plant Vitamin/Hormone Stimulant in application ratio as recommended by Stimulant Manufacture (per Section 329400 – Landscape Planting Accessories). Apply liquid matrix in sufficient quantity to thoroughly saturate the Planting Container Soil Mixture, and to eliminate voids and air pockets. Should any portions of the root mass be exposed, add additional Mixture as needed to thoroughly cover the root mass.

I. Mulching: Apply Mulch in Container as indicated on the Contract Drawings. Refer to Section 329400 – Landscape Planting Accessories for type and requirements.

3.6 PRUNING PLANT MATERIAL

A. At no time shall Plant Material be pruned, trimmed, thinned, shaped, or topped prior to delivery. Pruning, trimming, thinning, shaping, or topping of Plant Material shall be

only conducted on the Project Site, and under the presence and direction of the Landscape Architect or approved Certified Arborist. Plant Material that has been pruned and delivered to the Project Site without prior approval by the Landscape Architect or an approved Certified Arborist will be rejected.

B. When directed by the Landscape Architect or an approved Certified Arborist, Contractor shall prune, thin, and shape plant material, according to standard horticultural practice, to preserve the natural character of the Plant Material.
   1. Pruning and remedial work shall be done per ANSI A300.
   2. Prune trees to retain required height and spread. Do not cut tree leaders; remove only injured or dead branches from trees.
   3. Prune shrubs accordingly to retain natural character.
   4. Provide pruning, cabling and bracing, irrigation, pest and disease control and other remedial treatments as recommended to assure the long-term health of the trees and existing vegetation, and the safety of persons and property.
   5. Newly planted trees shall be pruned near the termination of the Landscape Establishment Period, per the direction of the Landscape Architect, as required.

3.7 CLEAN UP AND PROTECTION

A. During installation operations, keep Work area in an orderly and safe condition. Contractor shall remove trash caused from his Work on a weekly basis throughout the duration of the Work.

B. Protect landscaping from damage due to landscape operations, operations by other Contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

C. Upon completion of his Work under this Section, the Contractor shall remove rubbish, waste, debris, excess construction materials, surplus soil and other items resulting from construction operations and legally dispose of it off the Owner's property.

D. Scars, ruts, or other marks in the ground caused by the Contractor's Work shall be repaired.

E. Remove equipment and implements of service, and leave the entire Project Site area in a neat, clean, and Owner-approved condition.

F. Labels: Remove all nursery-type labels, flags, and or identification markings from Plant Materials.

3.8 FINAL REVIEW

A. Final Review under this Section shall be performed upon completion of the Landscape Establishment Period. Refer to Section 32 98 13 – Landscape Establishment Period, for requirements.

END OF SECTION

SECTION 329400
LANDSCAPE PLANTING ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete exterior Landscape Planting Accessories installation, as shown in the Contract Drawings, and as specified herein this Section.

B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
   1. Mulches (wood products).
   2. Tree Root Aeration Units (a.k.a. Tree Chimney's).
   3. Root Control Barriers.
   4. Stakes and Guys.
   5. Miscellaneous Materials (Herbicides, Vitamin Stimulant/Root Hormone, etc.).
   6. Metal Edging

C. Related Sections: The following Sections contain requirements that relate to Work in this Section:
   1. Section 312219 – Landscape Grading.
   2. Section 321323 – Site Concrete
   3. Section 328400 – Irrigation Systems.
   4. Section 329113 – Soil Preparation.
   5. Section 329200 – Lawns & Grasses.
   6. Section 329300 – Exterior Plants.
   7. Section 329813 – Landscape Establishment Period.

1.2 DEFINITIONS AND APPLICABLE STANDARDS

A. References:
   1. ASTM - American Society for Testing and Materials.
   2. ANSI – American National Standards Institute.

B. Definitions: (Not Used).

C. Measurements:
   1. PSI: Measurement, in pounds per square foot.
   2. CU/FT: Measurement, in cubic-foot.
   3. PPM: Measurement, in parts per million.

1.3 SUBMITTALS

A. General: Submit each item in this Article in four (4) bound Submittal Booklets, and four (4) sets of Material Samples for review by the Landscape Architect.

B. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified and legible (through yellow highlighter or other specific identification methods) information indicated herein this Article.

C. Product/Material Data. Submit available product/material literature (including color charts) supplied by manufacturer's, indicating that their products comply with specified requirements. Provide manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of product/material.

D. Material Samples: For each type of material specified herein, provide Material Samples for review by the Landscape Architect. Include the full range of exposed color and texture expected in the completed Work. Provide Material Samples bound and individually wrapped in re-sealable labeled plastic bags (as applicable):
   1. 0.50 cubic foot of Landscape Mulch Material (Shredded Wood Mulch).
   2. One (1) two-foot (2'-0") long section of Tree Root Aeration Unit assembly.
   3. One (1) two-foot (2'-0") long sample of Root Control Barrier.
   4. One (1) set of Tree Tying/Staking Materials for each type used, as applicable.
   5. One (1) set of Tree Guying Materials for each type used, as applicable.
   6. One (1) two-foot (2'-0") length of Vine Support Tape, and one (1) Vine Support Anchor, as applicable.
   7. One (1) two-foot (2'-0") square sample of Erosion Control Material for each type used, as applicable.
   8. One (1) two-foot (2'-0") sample of Landscape Edging Materials and Accessories (stake, etc), to verify gauge, size, and color selected, as applicable.

E. Scaled Shop Drawings: Not Required.

F. Field-Constructed Mock-ups: Not Required.

G. Qualification Data: Submit names for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience on similar Landscape Planting Accessories installations.

H. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested. Partial Submittals will not be accepted.

I. No Work shall proceed under this Section until Submittal requirements indicated herein have been reviewed accordingly by the Landscape Architect.

1.4 QUALITY ASSURANCE AND CONTROL

A. Installer Qualifications:
   1. Requirement: Valid California (Landscaping Contractor) License.
   2. Engage an experienced Installer who has completed Landscape Planting Accessories work similar in material, design, and extent to that indicated for this Project and with a record of successful installation.
   3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that installations under this Section are in progress.

B. Observation: Landscape Architect may observe installation of Landscape Planting Accessories at Project Site for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Landscape Planting Accessories for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected Accessories immediately from Project site.

C. Manufacturer's Directions: Follow Manufacturer's directions and drawings in cases where the Manufacturers of articles used in this Section furnish directions covering points not shown in the Contract Drawings and Contract Specifications.

D. Permits, Fees, Bonds, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, testing services, and inspections necessary to perform and complete Work under this Section.

E. Single-Source Responsibility: Obtain each color, type, and variety of products/materials from a single source with resources to provide products/materials of consistent quality in appearance and physical properties without delaying Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Provide new, unused materials indicated under this Section. Store and secure properly to prevent theft or damage. Deliver and store perishable material in original, unopened packaging. It is the responsibility of the Contractor to install "factory condition" Units.

B. Damaged Materials: Be responsible for all damage or disfiguration of Work until Final Acceptance. Remove off site and replace at no additional cost to Owner all damaged or rejected materials.

C. Deliver materials so as to not delay Work, and install only after preparations for installation have been completed.

1.6 COORDINATION, SCHEDULING, AND OBSERVATIONS

A. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

B. Excavation: When conditions detrimental to installing Landscape Planting Accessories are encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease installation operations and notify Landscape Architect for further direction.

C. Field Measurements: Contractor shall take field measurements as required. Report major discrepancies between the Contract Drawings and field dimensions to the Landscape Architect prior to commencing Work.

D. Installation: Perform installation of Landscape Planting Accessories only when weather and soil conditions are suitable in accordance with locally accepted practices.

E. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected materials immediately from Project site. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

1.7 SUBSTITUTIONS

A. Consideration: Materials to be considered equal to the Materials indicated herein this Section shall be reviewed by the Landscape Architect. Materials with equal performance characteristics produced by other Manufacturer's and/or Distributors may be considered, providing deviations in dimensional size, color, composition, operation, and/or other characteristics do not change the design concept, aesthetic appearance, nor intended performance, as solely judged by the Landscape Architect. The burden of proof on product equality is on the Contractor.

B. Specific reference to Manufacturer's names and products specified herein are used as standards of quality. This implies no right to the Contractor to substitute other materials without prior written approval by the Landscape Architect for Work under this Section.

C. Materials substituted and installed by the Contractor, without prior written approval by the Landscape Architect, may be rejected. Contractor shall not be entitled to be compensated by the Owner where the Contractor has installed rejected substitutions without receiving prior written approval.

D. Contract Price: Substituted Materials under this Section shall not increase the Contract price.

1.8 LANDSCAPE ESTABLISHMENT PERIOD

A. Refer to Section 329813 – Landscape Establishment Period, for requirements under this Article.
   1. During the duration of the Landscape Establishment Period, continuously maintain Landscape Planting Accessories by tightening, holding plumb, and/or repairing Staking and/or Guying supports, providing adequate depths and coverage requirements of Landscape Mulching Materials, monitoring drainage within Tree Root Aeration Units, hold Edging Materials true and in proper alignments, and other requirements, as required, to establish healthy, viable landscape planting materials until Final Acceptance of Work is granted.

PART 2 - PRODUCTS

2.1 LANDSCAPE MULCH MATERIALS

A. A. Shredded Wood Mulch: Shredded Wood Mulch, free from deleterious materials, debris, and weed seed. Suitable as a top dressing of trees, shrubs and groundcovers, consisting of following:
   1. Type: Shredded cedar, redwood, fir, or hardwood commercial wood bark products, composted with humus and leaf materials. Shredded Wood Mulch shall be graded and to average dimensions of one-inch (1") to three-inches (3") in length, and flat in cross-section.
      a. Minimum organic matter content at 80%.
      b. pH between 5.0 and 8.0.
      c. Salt content shall be less than 4 millimho/cm @ 25 ˚ C. on a saturated paste extract.
      d. Boron content of the saturated extract shall be less than 1.0 parts per million.
      e. Calcium carbonate shall not be present.
      f. Carbon:Nitrogen ratio is less than 100:1.
      g. Compost shall be aerobic without malodorous presence of decomposition products.
      h. Maximum particle size shall be 2 inches. A maximum of 5% shall pass a No. 2 screen.

Maximum Total Permissible Pollutant Concentrations (in parts per million (PPM)) on a dry weight basis:	
Arsenic	*20 ppm*
Molybdenum	*30 ppm*
Cadmium	*15 ppm*
Nickel	*50 ppm*
Chromium	*150 ppm*
Selenium	*25 ppm*
Cobalt	*50 ppm*
Silver	*10 ppm*
Copper	*150 ppm*
Vanadium	*50 ppm*
Lead	*150 ppm*
Zinc	*150 ppm*
Mercury	*10 ppm*

2. Coverage depth:
   a. Refer to Part III indicated herein this Section.
3. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
   a. ES-2 Mulch, Agromin Horticultural Products.
   b. Pacific Mulch™, Greenways Environmental, Lake Forest, CA.
   c. Walk-On Chips, Earthworks Soil Amendments, Inc.
   d. Red Fir Bark, Greenway Compost.
   e. A-1 Oak Deco Chips, Hanson Aggregates/A-1 Soils.
   f. #SBM 3, Special Mulch #3, Plants Choice, Inc., San Diego, CA
   g. Or equal, as approved by the Landscape Architect.

2.2 TREE ROOT AERATION UNITS (TREE CHIMNEY'S)

A. General: Tree Root Aeration Units are a complete assembly, consisting of a perforated Aeration Pipe Tube, wrapped in Geo-textile Filter Fabric sleeving, and topped with a Grate.

B. Aeration Pipe Tube: Manufactured from high-density polyethylene (HDPE) resin, meeting ASTM F810. Pipe shall be perforated with machine-drilled holes, set either with 3/8" holes on 4" centers at 120 degrees, or on-half-inch (½") holes on five-inch (5") centers at one-hundred-twenty (120) degrees.
   1. Length: As required, per Contract Drawings.
   2. Size (Diameter):
      a. 4" diameter Pipe.
   3. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
      a. 3000 Triple Wall Drainage Pipe, ADS.
      b. COEX, PSP.
      c. Big "O" Drainage Tubing, Armtec.
      d. Or equal, as approved by the Landscape Architect.

C. Geo-textile Filter Fabric Sleeving for Aeration Pipe Tube: Permeable, lightweight, continuous, non-woven, UV resistant, synthetic geo-textile (nylon or polyester) filament material, engineered to allow water permeability and deter soil permittivity, per ASTM D4491. Fabric shall be non-biodegradable, resistant to acids and alkalis, and sized accordingly.
   1. Length: As required, per length of Aeration Pipe.
   2. Size: As required, to sleeve (snugly fit) over the diameter of the specified Aeration Pipe tube.
   3. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
      a. Drain Sock, ADS.
      b. Drain-Sleeve Filter Fabric, Carriff Corporation.
      c. Filter Fabric, Zodiac Fabrics, Inc.
      d. Big "O" Sock Filter, Armtec.
      e. Drain-Eez, Christy's.
      f. Or equal, as approved by the Landscape Architect.

D. Aeration Pipe Grates (sized accordingly to fit snugly to the specified Aeration Pipe Tube).
   1. Shrub and Groundcover Areas: Atrium-type Grate.
      a. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
         1) 4" Atrium Grate #78S (sand color), National Diversified Sales (NDS), Camarillo, CA.
         2) Or equal, as approved by the Landscape Architect.
   2. Lawn Areas: Flat-type Grate, round in shape.
      a. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
         1) 6"(Verify size with civil dwgs) Round Grate #50 (green color), National Diversified Sales (NDS), Camarillo, CA.
         2) Or equal, as approved by the Landscape Architect.

2.3 ROOT CONTROL BARRIERS

A. Plastic Root Control Barrier:
   1. General: Plastic Root Control Barrier shall be a long-term root control system for trees, fully permeable to oxygen and water to sustain and direct plant growth. Plastic Root Control Barrier shall be manufactured of an extruded, high-impact black homo-polymer (polyethylene or polyolefin) plastic, with minimum 50% post-consumer recycled material, and UV inhibitors. Plastic Root Control Barrier shall be composed of a system consisting of a series of integrally-molded, self-interlocking Barrier Panels. Polystyrene- based plastic is unacceptable.
      a. Size: Each panel shall be a minimum of twenty-four-inches (24") in width and thirty-six-inches (36") in depth, extruded to a mean thickness of .08 inches, with ½" to ¾" raised vertical ribs running perpendicular to the panel and spaced six-inches (6") on-center. Provide quantity as required of integrated interlocking joint panels, in lengths as required.
      b. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
         1) UB-36-2 Deep Root, Deep Root Partners, San Francisco, CA, 800-458-7668.
         2) Root Solutions, Vespro, Inc., San Rafael, CA, 800-554-0914.
         3) Dual Purpose Panels, .080 Thickness, Villa Root Barrier, Inc. Lake Elsinore, CA, 800-654-4067.
         4) RP Series Root Barrier Panel, NDS, 800-726-1994.
         5) CP Series Root Barrier Panel, Century Products USA, 714-632-7083.
         6) Or equal, as approved by the Landscape Architect.

2.4 STAKES AND GUYS

A. Tree Staking Assembly:
   1. Wooden Stake Tree Staking Assembly: Complete tree staking Unit, consisting of Lodge Pole Pine Tree Stakes with (choose one: Tree Ties/Tree Straps/Twist Braces)
      a. Tree Stakes: Lodge Pole Pine Wooden Tree Stake, straight shaft, shaved and cut, cleaned and bare of branches and stubs, free of loose knots, bends, splits, or bows, of uniform thickness, with a minimum diameter of either two-inches (2") or two-one-half (2-1/2") to three-inches (3"). Lengths shall be eight-feet (8'), ten-feet (10') or twelve-feet (12'), as required, to adequately and firmly penetrate the sub grade and support the tree. Stake shall have a minimum ten-inch (10") long tapered/conical driving point, and chamfered top to minimize splitting when driven. Stake shall be pressure treated (per Federal Specification TT-W-00571-J-Table 2) with an EPA-registered pesticide containing inorganic arsenic (copper chromium arsenate, meeting Federal Specification TT-W-550-Type 1) to protect it from insect attack and decay.

1) Quantity, Size, and Length per tree:
   a) 5-gallon container stock: One (1), two-inch (2") diameter, eight-foor (8') long or ten-foot (10') long (as required) Wooden Tree Stake per tree, (Where Twist Braces are used, provide two (2) Wooden Tree Stakes).
   b) 15-gallon container stock: One (1), two-inch (2") diameter, 10'-0 long or 12'-0" long (as required) Wooden Tree Stake per tree. (Where Twist Braces are used, provide two (2) Wooden Tree Stakes).
   c) 24" box container stock: Two (2) Two-inch (2") diameter, ten-foot (10') long or twelve-foot (12') long (as required) Wooden Tree Stakes per tree.
   d) >24" box container stock: Minimum two (2) two-one-half-inches (2-1/2") or three-inches (3") diameter, ten-foot (10') or twelve-foot (12') long (as required) Wooden Tree Stakes per tree.
2) Special Circumstances: Should lengths of Wooden Tree Stakes be inadequate to satisfactorily support the tree being staked in an upright, plumb condition, Contractor shall provide Metal Stake Tree Staking Assembly as indicated herein this Article.
3) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
   a) Sullivan & Mann Lumber Company, Tustin, CA.
   b) BVC Tree Stakes.
   c) TruStakes, 4Seasons Wood Products.
   d) Or equal, as approved by the Landscape Architect.

b. Tree Straps: Non-stretch, biodegradable, dyed dark-green cotton color, one-inch (1") wide x eighteen-inches (18") long, with one-inch (1") brass grommets at each end. Break strength at 260 lbs. nominal.
1) Quantity, Size, and Length per tree:
   a) 5-gallon container stock: Provide two (2) Tree Straps minimum for each Tree Stake provided.
   b) 15-gallon container stock: Provide two (2) Tree Straps minimum for each Tree Stake provided.
   c) 24" box container stock and larger: Provide two (2) Tree Straps minimum for each set of Tree Stakes provided.
2) Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
   a) #3018 Original Treestrap®, GCS.
   b) Or equal (no known equal).
3) Tree Strap Wire: Smooth, galvanized annealed Steel Wire, 12 gauge. Provide Wire in adequate lengths to anchor the grommet ends of the Tree Straps to the Tree Stakes.

2. 2. Tree Guying Hardware
3. Tree Support Root Guying System (complete below grade application).

a. Pre-assembled, pre-packaged, tree anchoring system, specifically designed and manufactured to hold the tree's root ball in place, with only the tree protruding from the ground. System components (sized accordingly to tree caliper) include anchors, wire rope, turn buckles, tree collars, and wire rope clamps.
b. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
   1) Duckbill Tree Anchor System, Foresight Products, LLC, 6430 E. 49th Drive, Commerce City, CO 80022, 800-325-5360.
   2) Or equal (no known equal).
c. Product Application:
   1) For trees up to 3" caliper, Duckbill Tree Anchor System #68RBK.
   2) For trees up to 6" caliper, Duckbill Tree Anchor System #88RBK.

B. Tree Staking for Trees located in Tree Grates:

2.5 MISCELLANEOUS MATERIALS

A. Water: Per ASTM C94, from potable domestic source, and free from deleterious materials such as oils, acids, and organic matter. Transport as required.

B. Stress Reducing Agent:
1. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
   a. Roots Concentrate, Roots, Inc., Independence, MO.
   b. Or equal (no known equal).
2. Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.

C. Wetting Agent and Soil Penetrant:
1. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
   a. Roots NoBurn®, Roots, Inc., Independence, MO.
   b. Naiad-SS,
   c. Or equal, as approved by the Landscape Architect.
2. Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.

D. Herbicides: EPA registered and approved, from the following:
1. Non-Selective Post-Emergent Herbicide: Spray-applied solution containing a minimum of 41% of the active ingredient "glyphosate" (full strength), with a surfactant, mixed with water accordingly per the Manufacturer's directions.

a. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
   1) Roundup® PRO, (41% glyphosate), Monsanto Company, St. Louis, MO.
   2) Roundup® PRO Concentrate (50% glyphosate), Monsanto Company, St. Louis, MO.
   3) Honcho® Plus, (41% glyphosate), Monsanto Company, St. Louis, MO.
   4) High Yield® Kill-Zall Weed & Grass Killer, (41% glyphosate),Voluntary Purchasing Groups, Boneham, TX.
   5) Or equal, as approved by the Landscape Architect.
b. Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.

2. Selective Pre-Emergent Herbicide (Packaged dry material application): Pre-emergent control of annual grasses and broadleaf weeds in turf grass areas, and woody ornamental trees, shrubs, vines, and groundcover areas. Product to contain the active ingredient "trifluralin".
   a. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
      1) Ronstar® 2G, (granular), Aventis Environmental Science USA.
      2) Snapshot® 2.5 GT (granular), (2% trifluralin), Dow AgroSciences LLC.
      3) Treflan® HFP (43% trifluralin), Dow AgroSciences LLC.
      4) Treflan® TR-10, (10% Granular trifluralin), Dow AgroSciences LLC.
      5) Surflan®, Dow AgroSciences, LLC.
      6) Or equal, as approved by the Landscape Architect.
   b. Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.
3. Selective Post Emergent Herbicide: Pre-mixed, flow-able formulation designed for product stability, uniformity in the spray solution and ease of handling. Post-emergent control of annual grasses, nutsedge, and broadleaf weeds in turf, generally with one (1) application.
   a. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
      1) Trimec® Plus.
      2) Ornamec® 170 Grass Herbicide.
      3) Or equal, as approved by the Landscape Architect.
   b. Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.

E. Plant Vitamin/Hormone Stimulant:

1. Provide in a diluted liquid solution with water, at the time of watering-in recently planted plant species.
   a. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
      1) SUPERthrive, Vitamin Institute.
      2) Roots2, Roots, Inc., Independence, MO.
      3) Root-Maxx Plus, Bio-Plex, Mt. Joy, PA.
      4) Or equal, as approved by the Landscape Architect.
   b. Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation practices of the Landscape Planting Accessories shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted horticultural practice, as approved by the Landscape Architect. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the landscape installation.

B. Examination: Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of Work of this Section. NO WORK UNDER THIS SECTION SHALL COMMENCE UNTIL ALL SUBMITTALS UNDER THIS SECTION HAVE BEEN REVIEWED AND APPROVED, IN WRITING. DO NOT PROCEED WITH INSTALLATION UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

C. Prior to Work in this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and as required, to the point where the installation of the Landscape Planting Accessories may commence properly.

3.2 PROTECTION OF SITE

A. Contractor shall protect existing and new improvements and systems installed prior to installation of Landscape Planting Accessories. Maintain protection in place until completion of Work and Landscape Establishment Period.

3.3 INSTALLATION OF TREE ROOT AERATION UNITS (TREE CHIMNEY'S)

A. General: Tree Root Aeration Unit(s) shall be installed after excavation of planting hole and prior to placement of Amended Planting Backfill Mixture.

B. Upon completion of excavation of planting hole, auger a twelve-inch (12") diameter hole at the edge of the excavation. Depth shall extend two-feet (2') beyond the compacted setting layer crown of native planting soil. Remove excess soil.

C. Pipe Installation: Slide Geo-Textile Filter Fabric Sleeve over full length of Perforated Aeration Pipe Tube. Secure open end (as set in bottom of hole) of Filter Fabric Sleeve with a knot or pipe wrap tape. Place assembly Unit plumb, in vertical position, in the bottom of the augered hole. Set the top of the Unit ½" above the finished surface elevation of the mulch layer.

D. Set Plant Material accordingly, and backfill the planting hole with Amended Planting Backfill Mixture, being careful not to provide backfill within the inside of the Tree Root Aeration Unit assembly.

E. Attach Aeration Pipe Grate to top end of the sleeved Aeration Pipe Tube extending above grade. Provide appropriate Pipe Grate indicated for the application.

F. Quantity Schedule:
   1. Provide one (1) Tree Root Aeration Unit assembly for each tree up to but not including a 24"-box container size.
   2. Provide two (2) Tree Root Aeration Unit assemblies located at opposing sides of the root ball and at opposite ends of the Tree Stakes and/or Deep Watering Bubblers, for each tree sized at 24"-box container and up to but not including a 48"-box container size.
   3. Provide three (3) Tree Root Aeration Unit assemblies, located equidistant along the sides of the root ball, for each tree sized at 48"-box container and larger.
   4. Location: Coordinate location of Tree Root Aeration Units to be set equally and in between locations designated to receive deep watering irrigation bubblers, where applicable.

3.4 INSTALLATION OF ROOT CONTROL BARRIERS

A. Plastic Root Control Barrier Panels:
   1. Verify the location of underground utilities prior to placement of Root Control Barrier Panels.
   2. Excavate sub grade to the required depth of the Panel, and install Panels as an interconnected, linear system, with the ribs of the Panels vertically aligned and facing towards the Plant Material's root mass.
      a. Install Root Control Barrier Panels along the entire perimeter edge for trees located in raised planters (as required).

b. Install Root Control Barrier Panels along the entire perimeter edge of the planting area for trees located in parking lots (as required).
c. Install Root Control Barrier Panels for trees where the tree trunk is located within a minimum of five-feet (5') of paved surfaces (sidewalks, curbs, plazas, etc).
1) Root Control Barrier Panels shall extend a minimum of ten-feet (10') from either side of the tree trunk, and follow along the profile of the paved surface being protected. Install Panels at a maximum of four-inches (4") to six-inches (6") from the edge of the paved surface.
d. Install Root Control Barrier Panels in specific locations as indicated on the Contract Drawings.

3. Install Root Control Barrier Panels plumb, or if conditions allow, with the top of the Panel slightly inclined towards the root mass. DO NOT install with the top inclined away from the root mass.
a. DO NOT install Root Control Barrier Panels in a circular pattern that encloses the root mass, thus restricting future growth of the Plant Material's root system.
4. Set top of the Root Control Barrier Panels at the finish graded surface, just below the mulch layer. Install per the requirements of the Manufacturer.

3.5 STAKING AND GUYING

A. General: Tree Staking and Tree Guying shall be per the direction of the Landscape Architect. Staking and/or guying of trees shall be completed immediately following tree planting operations.
1. Contactor shall provide new Tree Stake or Tree Guy assemblies; reconditioned or previously-used Tree Stake or Tree Guy assemblies shall not be permitted. Provide one (1) set of Tree Staking materials or Tree Guying materials per tree, as required. Trees shall remain plumb and straight from installation through the Contractor Warranty period. Staking and Guying assemblies shall remain the property of the Owner.

B. Staking/Guying Methodology: Unless otherwise directed on the Contract Drawings or as directed by the Landscape Architect based on field conditions, provide the following Staking/Guying Assemblies, as measured by the size of the tree being supported:
1. 5-gallon size Container Stock to 36"-Box Tree, or for trees up to 3" caliper: Provide Staking Method. Number of stakes per tree shall be as directed herein this Section.
2. For trees larger than 36"-Box size or over 3" caliper: Provide Staking or Guying Method, or as directed by the Landscape Architect.
3. Multi-trunk Trees: Provide Tree Guying Method, or as directed by the Landscape Architect.

4. Specimen-size Trees: Provide Tree Guying Method, or as directed by the Landscape Architect.

C. Tree Staking Method:
   1. Single Tree Stake (Wooden or Metal):
      a. Locate Stake at the closest point to the main trunk as possible, yet outside of the root ball and tree branch canopy.
      b. Firmly drive the tapered end of the Stake plumb into the undisturbed native sub-grade, perpendicular to the side of the prevailing wind, at the minimum depth indicated in the Contract Drawings, or deeper, as required, to firmly support the Stake and minimize any movement of the Stake. Do not damage the tree trunk nor branch canopy, nor penetrate the root ball with the Stake. Do not damage or splinter the Stake. Stake shall not touch the trunk nor branch canopy of the tree.
   2. Double Tree Stakes (Wooden or Metal):
      a. Locate Stakes at the closest point to the main trunk as possible, yet outside of the root ball and tree branch canopy.
      b. Firmly drive the tapered end of one (1) of the Stakes plumb into the undisturbed native sub-grade, perpendicular to the side of the prevailing wind, at the minimum depth indicated in the Contract Drawings, or deeper, as required, to firmly support the Stake and minimize any movement of the Stake. Do not damage the tree trunk or branch canopy, nor penetrate the root ball with the Stake. Do not damage or splinter the Stake.
      c. Install the other Stake in similar fashion, directly opposite from the first Stake (180 degrees), and equidistant from the tree trunk.
      d. Installed Stakes shall not touch the trunk nor branch canopy of the tree.
   3. Tying to Tree Stakes (Wooden or Metal):
      a. Tree Straps: Wrap and twist the Tree Strap around the tree trunk, at the lowest point where the tree gains the highest support, per the direction of the Landscape Architect. Secure the Strap with wire; thread the wire through the grommet ends of the Strap and twist wire to secure. Wrap other end of wire around the Stake, twist, and secure it to the Stake. (For Metal Stakes, thread wire through holes drilled through the stake). Repeat for other Stake(s), as required. For trees requiring multiple tree straps, locate additional straps as required along the tree trunk to provide additional vertical support. Cut off and bend back excessive wire beyond the twists to the Stake(s) to provide a safe condition. The tree shall be supported accordingly to assure a straight, firm position of the tree canopy, yet to allow enough slack to avoid rigid restraint of the tree.
      b. Once the tree is thoroughly staked, carefully remove the nursery stake(s). Backfill and tamp the nursery stake void(s) with planting soil.

D. Tree Guying: Install guying assembly per the Manufacturer's latest printed instructions.

3.6 MULCHING

A. General: Mulch backfilled surfaces of pits, trenches, planted areas, and other areas indicated.

B. Shredded Wood Mulch:
   1. General: Verify locations to receive Shredded Wood Mulch.
   2. Apply the following average thickness of Shredded Wood Mulch, and finish level with adjacent finished surfaces. Do not place Shredded Wood Mulch directly against trunks or stems of Plant Materials. Remove Shredded Wood Mulch that is placed against the growing bases or within the basal nodes of plants.
   3. Thickness/Depth: Three-inches (3"), minimum.
   4. While settlement and/or decomposition of the Shredded Wood may occur during the duration of the Contract, the Shredded Wood Mulch thickness as indicated shall be consistent throughout the duration of the Contract. The Contractor shall provide additional Shredded Wood Mulch, as needed, and as directed by the Landscape Architect, to maintain the specified constant thickness of the Shredded Wood Mulch, until Acceptance of Work is granted.

3.7 INSTALLATION OF MISCELLANEOUS MATERIALS

A. Anti-Dessicant: Apply using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage.
   1. When deciduous trees or shrubs are moved in full-leaf, spray with anti-desiccant at nursery before moving and again two (2) weeks after planting.

B. Stress Reducing Agent: Apply, as required and directed by the Landscape Architect, per Manufacturer's latest printed instructions.

C. Wetting Agent & Soil Penetrant: Apply, as required and directed by the Landscape Architect, per Manufacturer's latest printed instructions.

D. Herbicides: Apply, as required and directed by the Landscape Architect, per Manufacturer's latest printed instructions.

E. Plant Vitamin/Root Stimulant: Apply, per the Manufacturer's latest printed instructions. Refer to application requirements per Section 329300 – Exterior Plants.

3.8 CLEAN UP AND PROTECTION

A. For Work under this Section, keep Work area in a clean, orderly, and safe condition. Contractor shall remove trash caused from his Work on a weekly basis throughout the duration of the Work.

B. Protect landscaping from damage due to landscape operations, operations by other Contractors and trades, and trespassers. Maintain protection during installation and landscape establishment periods. Treat, repair, or replace damaged Landscape Planting Accessories as directed.

C. Upon completion of his Work under this Section, the Contractor shall remove rubbish, waste, debris, excess construction materials, and other items resulting from construction operations offsite as described herein this Section and directed by the Landscape Architect.

3.9 FINAL REVIEW

A. Final Review under this Section shall be performed upon completion of the Landscape Establishment Period. (Refer to Section 329813 – Landscape Establishment Period for requirements).

END OF SECTION

SECTION 329813
LANDSCAPE ESTABLISHMENT PERIOD

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete Landscape Establishment Period, as specified during progress of the Work, after installation, for a designated period after Preliminary Acceptance, as shown in the Contract Drawings, and as specified herein this Section.

B. Contractor acknowledges that the Services specified under this Section are not intended to express every detail of the Services to be provided by Contractor, and Contractor hereby represents that it is experienced and competent in providing Services that meets or exceeds generally accepted practices commensurate with those provided by other companies that provide such Service.

C. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
   1. Establishment of Landscape Installation, for a given frequency and duration as specified herein this Section. Work includes the following:
      a. Litter Control.
      b. Weed Control.
      c. Pest Control.
      d. Plant Care.
      e. Fertilization of Plant Materials.
      f. Plant Replacement.
      g. Plant Pruning.
      h. Plant Staking and Adjustments.
      i. Temporary Plant Protection.
      j. Operation, Adjustment, and Maintenance of Irrigation Controller and Irrigation System.
      k. Cleaning of Paving Surfaces.
      l. Reapplication of Mulching Materials.
      m. Raking of Decomposed Granite, Aggregate Surfacing, etc.
      n. Erosion Control and Drainage.
      o. Removal of Green Waste.

D. Related Sections: The following Sections contain requirements that relate to Work in this Section:
   1. Section 31 22 19 – Landscape Grading.
   2. Section 32 84 00 – Irrigation Systems.
   3. Section 32 91 13 – Soil Preparation.
   4. Section 32 92 00 – Lawns & Grasses.

5. Section 32 93 00 – Exterior Plants.
6. Section 32 94 00 – Landscape Planting Accessories.
7. Section 32 15 00 – Aggregate Surfacing.

1.2 DEFINITIONS AND APPLICABLE STANDARDS

A. References:
1. USDA – United States Department of Agriculture.
2. ASTM – American Society for Testing & Materials.
3. ANSI – American National Standards Institute.
4. ISA – International Society of Arboriculture.

B. Standards:
1. American National Standard for Tree Care Operation, Tree, Shrub, and Other Woody Plant Maintenance (ANSI A300), American National Standards Institute, Latest Edition.
2. American National Standard for Tree Care Operations (ANSI Z133), American National Standards Institute, Latest Edition.
3. Tree Pruning Guidelines, International Society of Arboriculture, 1995 Edition.
4. Pruning Standards for Shade Trees, National Arborists Association, Latest Edition.

1.3 SUBMITTALS

A. General: Submit each item in this Article in four (4) bound Submittal Booklets for review by the Landscape Architect.

B. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified and legible (through yellow highlighter or other specific identification methods) information indicated herein this Article.
1. Quality Control Submittals:
a. Schedule of maintenance operations and monthly status report, including list of equipment, materials proposed for the job, and watering schedule(s).
b. Licenses, permits and insurance required by the local jurisdiction, the State, or Federal government, pertaining to Work under this Section.
1) Pesticide Applicator: Valid California Qualified Applicator Certificate (QAC), with "B – Landscape Maintenance" Category, as administered by the California Department of Pesticide Regulation (DPR).
2) Employer of the California Qualified Applicator Certificate (QAC), with "B – Landscape Maintenance" Category:
a) The company which employs the person holding the QAC must possess a Maintenance Gardener Pest Control Business License, as administered by the California Department of Pesticide Regulation (DPR).

c. Monthly record of herbicides, insecticides and disease control chemicals used for the Project.
d. Written application recommendation by a licensed agricultural pest control advisor for weed, pest and disease controls restricted by the Director of Agriculture proposed for this Work.

2. Project Closeout Submittal:
a. Include in a single 3-ring binder a Landscape Maintenance Manual for use by the Owner, containing an indexed collection of all schedules, records and permits listed above, including documentation of accepted condition of planting and irrigation at Final Acceptance.

C. Scaled Shop Drawings: Not Required.

D. Field-Constructed Mock-ups: Not Required.

E. Qualification Data: Submit names for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience on similar Landscape Planting Accessories installations.

F. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested. Partial Submittals will not be accepted.

G. No Work shall proceed under this Section until Submittal requirements indicated herein have been reviewed accordingly by the Landscape Architect.

1.4 QUALITY ASSURANCE AND CONTROL

A. Qualifications:
1. Valid California C-27 (Landscaping Contractor) License.
2. Experience: Contractor or sub-contractor performing Work under this Section shall have a full-time employee assigned to the Project as foreman for the duration of the Contract. Employee shall have a minimum of four (4) years experience in landscape maintenance supervision, with experience or training in entomology, pest control, soils, fertilizers and plant identification. Employee shall speak English fluently.
3. Labor Force: Landscape maintenance labor force shall be thoroughly familiar with, and trained in, the Work to be accomplished, and shall perform the task in a competent, efficient manner acceptable to the Owner.

B. Requirements:
1. Supervision: Landscape Maintenance Foreman shall directly supervise the Work force during duration indicated herein this Section. Notify Owner of changes in supervision.

2. Identification: Provide proper identification during duration for landscape maintenance firm's vehicles and labor force. Be uniformly dressed in a manner satisfactory to the Owner.

1.5 PROJECT/SITE CONDITIONS

A. Site Visit: At beginning of the designated Landscape Establishment Period, visit and tour the site with the Owner's Representative, Landscape Architect, and other interested parties, to clarify the scope of Work, and understand existing project/site conditions.

B. Documentation of Conditions: Document the general condition of installed plant materials, recording those which are healthy and thriving, and unacceptable materials which are damaged, dead, and/or dying and in need of replacement.

C. Irrigation System: Document general condition of existing irrigation system, making sure that faulty, improper, and/or non-functioning irrigation materials or equipment are reported.

1.6 SEQUENCING AND SCHEDULING

A. Perform Work under Landscape Establishment Period during hours mutually agreed upon between Owner and Contractor.

B. Work force shall be present at the Project Site at a minimum duration of at least once per week, and at other times, as necessary, to perform specified Work, in accordance with the approved schedule under the Landscape Establishment Period.

1.7 WARRANTY

A. Specific Requirements: Refer to the following Sections:
1. Section 32 84 00 – Irrigation Systems.
2. Section 32 92 00 – Lawns & Grasses.
3. Section 32 93 00 – Exterior Plants.
4. Section 32 94 00 – Landscape Planting Accessories.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Materials and equipment as required to perform Work under this Section shall be provided by Contractor.

B. Water: Clean, potable and fresh, as available from Owner.

C. Fertilizers:
   1. Fertilizer Tablets: Tightly compressed, slow-release and long-lasting complete fertilizer tablets, bearing manufacturer's label of guaranteed analysis of chemicals present. Refer to Section 32 91 13 – Soil Preparation, for requirements.
   2. Balanced, once-a-season application, controlled-release Fertilizer(s), with a blend of coated prills which supply controlled-release nitrogen, phosphorus and potassium, and uncoated, rapidly soluble prills containing nitrogen and phosphorus.

D. Herbicides, Insecticides, and Fungicides:
   1. Provide materials with original manufacturers' containers, properly labeled with guaranteed analysis.
   2. Use non-staining materials.

E. Replacement Tree Guys, Stakes, Ties and Wires: Match originally accepted existing materials installed on the Project.

2.2 EQUIPMENT

A. General: Use only the proper tool(s) required for each task under this Section. Maintain tools in sharp, properly-functioning condition. Clean and sterilize pruning tools prior to usage.

B. Insect/Disease Prevention: Provide measures to prevent introduction of insect or disease-laden materials onto the Site. Refer to Section 32 93 00 – Exterior Plants.

PART 3 - EXECUTION

3.1 DURATION OF LANDSCAPE ESTABLISHMENT PERIOD

A. Following satisfactory completion of all items included on the Landscape Punch List, the contracted Landscape Establishment Period shall commence and progress.

B. Duration:
   1. A minimum of 90 calendar days.

3.2 COMMENCING THE LANDSCAPE ESTABLISHMENT PERIOD

A. Preliminary Review: As soon as landscape installation is substantially completed per the Contract Documents, Contractor shall arrange to hold a preliminary review on-site with the Landscape Architect, Owner, and other interested parties to evaluate the

condition and execution of the completed Work. Evaluation of the Work shall be executed by the Landscape Architect through a "Landscape Punch List".

B. Date of Review: Notify Landscape Architect at least five (5) working days prior to anticipated Date of Review.

C. Commencing the Landscape Establishment Period: The date on which the Landscape Architect determines that the landscape installation is substantially-complete, whereas outstanding Work included on the Landscape Punch List is addressed and satisfactorily completed to the satisfaction of the Landscape Architect.

3.3 PREPARATION

A. Protection:
   1. Protect new landscape planting areas from damage during duration of Landscape Establishment Period, until Final Acceptance.
   2. Provide temporary protection fences, barriers and signs, as required, for protection.

B. Replacements:
   1. Immediately treat or replace plant materials as directed, which become damaged or injured as a result of Contractor's operations or negligence, per the Landscape Architect, at no additional cost to Owner.
   2. Replacement plant materials shall match size and variety of plant material being replaced.

3.4 PLANTING ESTABLISHMENT

A. Watering:
   1. Maintain watering basins around the perimeter of the installed plant materials so that enough water can be applied to establish and maintain adequate soil moisture through the root zone of the plant materials. Re-dish and tamp basins accordingly which have become damaged or have failed since installation.
   2. For supplemental hand watering of watering basins, use a water wand to break the water force. Do not permit use of "jet" type watering equipment. Do not permit crown roots to become exposed to air through dislodging of soil and mulch.
   3. Mulch: Maintain originally specified thickness of mulch material to reduce evaporation and frequency of watering.
   4. During rainy season, open basins to allow surface drainage away from the root crown where excess water may accumulate. Restore watering basins at end of rainy season.
   5. At the end of the rainy season, re-dish and tamp watering basin at trees and shrubs.
   6. Provide and maintain any temporary piping, hoses, watering equipment to convey water from sources.

7. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.

PART 4 -

A. Settlement of Plant Materials: Reset/replant sunken or settled plant materials to proper grades and in upright position.

B. Weed Control:
   1. Planting areas throughout site shall be weed-free at all times, including areas between plants and along watering basins.
   2. Use only recommended and legally-approved herbicides to control and maintain weed growth.
   3. Avoid frequent soil cultivation that destroys shallow roots and breaks the seal of pre-emergent herbicides.

C. Pruning:
   1. Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached, and which have vertical spacing of eighteen-inches (18”) to forty-eight-inches (48”) and radial orientation so as not to overlay each another.
   2. Prune trees to eliminate diseased or damaged growth, and narrow “V-shaped” branch forks that lack strength. Reduce toppling and wind damage by thinning-out crowns.
   3. Prune trees to maintain growth within space limitations, maintaining a natural appearance and balancing crown with roots.
   4. No stripping of lower branches of young trees shall be permitted.
   5. Retain lower branches in a "tipped back" or pinched condition to promote caliper trunk growth. Do not cut back to fewer than six (6) buds or leaves on such branches. Only cut lower branches flush with the trunk after the tree is able to stand erect without staking or other support.
   6. Thin out and shape evergreen trees when necessary to prevent wind and storm damage. Do primary pruning of deciduous trees during the dormant season. Do not permit any pruning of trees prone to excessive "bleeding" during growth season.
   7. Prune damaged trees or those that constitute health or safety hazards at any time of year as required.
   8. Make pruning cuts clean and close to the trunk, without cutting into the branch collar. "Stubbing" will not be permitted. Cut smaller branches flush with trunk or lateral branch. Make larger cuts one-inch (1”) diameter or larger parallel to shoulder rings, with the top edge of the cut at the trunk or lateral branch.
   9. Branches too heavy to handle shall be precut in three (3) stages to prevent splitting or peeling of bark. Make the first two (2) cuts eighteen inches (18”) or more from the trunk to remove the branch. Make the third cut at the trunk to remove the resulting stub.
   10. Do not prune or clip shrubs into balled or boxed forms unless specifically called for by design.

11. Clip shrubs to be hedged when branches project two-inches (2") beyond limit of clipped hedge shown on the Contract Drawings.
12. Take extreme care to avoid transmitting disease from one infected plant to another. Properly sterilize pruning tools before going from one infected plant to other plant materials.

D. Staking and Guying of Trees:
1. Adjustments: Inspect stakes and guys periodically (minimum once per month) throughout duration of Landscape Establishment Period to check for rubbing of staking materials on trunks or branches causing bark wounds.
2. Repair and replace faulty staking and guying materials as shown and as specified.

E. Maintenance of Existing Plant Materials to Remain:
1. General: Conform to applicable paragraphs regarding pruning, watering, spraying and fertilizing of new plant materials as indicated herein this Section.
2. Symptoms: Be alert to symptoms of construction damage to existing plantings as evidenced by wilting, un-seasonal or early flowering or loss of leaves, and insect or disease infestation due to declining vigor.
3. Notification: Submit in writing of evidences of declining vigor immediately upon discerning the problem. Take appropriate interim measures to mitigate the severity of the problem as specified in this Section.
4. Proposal: Submit written proposal and cost estimate for the correction of all conditions before proceeding with permanent correction Work.

4.2 GROUNDCOVER ESTABLISHMENT

A. Irrigation:
1. Check for moisture penetration throughout the root zone at least twice a month.
2. Water as frequently as necessary to maintain healthy growth of groundcovers.

B. Weed Control:
1. Control weeds, preferably by hand removal, with pre-emergent herbicides and with selective systemic herbicides.
2. Minimize hoeing of weeds in order to avoid plant damage.

C. Fertilization:
1. Recently installed plant materials: Verify with Owner actual completion date of planting installation and rate of prior application of fertilizers.
2. New Plant Materials: Place Planting Tablets (per Section 329113 – Soil Preparation) beside the root ball about one-inch (1") from root tips.
3. Established Plant Materials: Do not use complete fertilizers unless soil test shows specific nutrient deficiencies.

D. Mowing and Edging:

1. Edge groundcovers to keep in bounds. Trim top growth as necessary to achieve an overall even appearance.
2. Ground covers which lend themselves to mowing shall be mowed to specified height above finished grade in order to renew growth, improve density and attractiveness.

E. Replacements:
1. Replace dead and missing plants after obtaining Owner's agreement to pay for replacement.
2. Damages due to Contractor's negligence shall be paid for without charge to Owner.

4.3 INSECTS, PESTS, AND DISEASE CONTROL

A. Inspection: Inspect plant materials for signs of stress, damage and potential trouble from the following:
1. Presence of insects, moles, gophers, ground squirrels, snails and slugs in planting areas.
2. Discolored or blotching leaves or needles.
3. Unusually light green or yellowish green color inconsistent with normal green color of leaves.

B. Personnel: Only licensed, qualified, trained personnel shall perform spraying for insect, pest and disease control.

C. Application: Spray with extreme care to avoid all hazards to any person or pet in the area or adjacent areas.

4.4 IRRIGATION SYSTEM

A. General:
1. Repair without additional charge to Owner damages to Irrigation System caused by Contractor's operations. Perform repairs within one (1) watering period.
2. Report promptly to Owner accidental damage not resulting from Contractor's negligence or operations.
3. Twice a month, use a probe or other acceptable tool to check the rootball moisture of representative plants as well as the surrounding soil.

B. Cleaning and Monitoring the System:
1. Continually monitor the irrigation systems to verify that they are functioning properly as designed. Make program adjustments required by changing field conditions.
2. Prevent spraying on windows, building walls, by balancing the throttle control on the remote control valves and the adjustment screws on the sprinkler heads. Do not allow water to atomize and drift.

4.5 AGGREGATE SURFACING MATERIALS

A. Aggregate Surfacing:
   1. Maintain Aggregate Surfacing materials at the depth indicated in the Contract Documents. Replace Aggregate Surfacing that is unlike in character (color, size, texture). Defective, fractured, stained, or material which does not meet the requirements herein in this Section shall be removed and replaced with appropriate Aggregate Surfacing material as specified.
   2. Rake Aggregate Surfacing surfaces smooth, consistent, and level, with no depressions, voids, rills, footprints, etc. Fines from the Aggregate Surfacing that are located on the finished surface shall be raked and/or removed accordingly to maintain a clean, consistent Aggregate Surfacing finish.
   3. Maintain Aggregate Surfacing free of stains, weeds, discoloration, trash, fines, debris, soil, sand, or other foreign material.
      a. Contractor shall exercise care so as not to contaminate Aggregate Surfacing with Shredded Wood Mulches, plant materials, soil, or other foreign substances.
      b. Soil that has contaminated the Aggregate Surfacing areas shall be removed from the Aggregate Surfacing. Raking to "hide" the soil below the finished surface of the Aggregate Surfacing is not acceptable.

PART 5 -

5.1 GRADING AND DRAINAGE

A. During the Landscape Establishment Period, all flow lines shall be maintained to allow for free flow of surface water. Displaced material which interferes with drainage shall be removed and placed as directed. Low Spots and pockets shall be graded to drain properly. Jute netting or other erosion control measures as directed shall be installed at flow lines and other locations where surface erosion is evident.

B. Damage to planting areas shall be repaired immediately and throughout the Landscape Establishment Period. Depressions caused by vehicles, bicycles, or foot traffic shall be filled and leveled. Replant damaged areas.

C. All paved areas shall be washed and maintained in a neat and clean condition at all times.

D. All subsurface drains and inlets shall be periodically cleared of debris, leaves, trash, etc., and flushed with clear water to avoid buildup of silt and debris.

5.2 CLEANING

A. General: Dispose of pruned plant materials, vacuum turf grass clippings and leaves, sweep walkways and rake smooth mulched areas. Remove from the site containers and other evidence of maintenance activities.

5.3 TERMINATION OF THE LANDSCAPE ESTABLISHMENT PERIOD

A. Final Acceptance Procedure:
   1. Work will be accepted by the Landscape Architect upon satisfactory completion of all Work, including Landscape Establishment Period, but exclusive of replacement of materials under the Warranty Period.
   2. Submit a written request to Landscape Architect for review for Final Acceptance at least five (5) working days prior to anticipated Final Review date, which is at the end of the Landscape Establishment Period.

B. Corrective Work:
   1. Work requiring corrective action or replacement shall be performed within ten (10) calendar days after the Final Review.
   2. Perform corrective Work and materials replacement in accordance with the Contract Documents, Work shall be made by the Contractor at no cost to the Owner.
   3. After corrective Work is completed, the Contractor shall again request a Final Review for Final Acceptance as outlined above.
      a. Continue maintenance of all landscaped areas until such time as all corrective measures have been completed and accepted.

C. Conditions for Acceptance of Work at End of Landscape Establishment Period:
   1. Each plant shall be alive and thriving, showing signs of growth and no signs of stress, disease, or any other weaknesses.
   2. Replace plant materials not meeting these conditions. An additional Warranty Period equal in length to the original shall be commenced for all such plants and planted areas.

D. Final Acceptance Date: The date on which the Landscape Architect issues a Letter of Final Acceptance. Upon Final Acceptance, Owner will assume responsibility for maintenance of the Work beyond the Landscape Establishment Period.

5.4 CLOSE OUT

A. Landscape Maintenance Record:
   1. Submit binder to Owner with documentation and records required and utilized during the Landscape Establishment Period.

B. Keys and Identification: Return keys and identification materials supplied by Owner for the purpose of site access.

END OF SECTION

SECTION 331000

WATER DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes piping and specialties for combined potable and fire protection water service outside the building.

B. Related Sections include the following:
1. Section 312000 - Earthwork for trench excavation and backfill.
2. Drawings for potable and fire protection piping inside the building.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Minimum Working Pressures: The following are minimum pressure requirements for piping and specialties, unless otherwise indicated:
1. Combined Potable Water and Fire Protection Water Service: 200 psig (1380 kPa).

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: For the following:
1. Pipe, joint restraints and fittings.
2. Valves and covers
3. Backflow preventer
4. Fire Department Connection

C. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances," for materials, installations, tests, flushing, and valve and hydrant supervision.

B. Comply with NSF Standard 61, “Drinking Water System Components”, for material, installation, and testing requirements.

C. Comply with City of Rosemead requirements for tapping of water mains.

D. Comply with City of Rosemead standards for potable water-service piping for testing and disinfections.

E. Comply with City of Rosemead Fire Department installation and testing requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves according to the following:
   1. Ensure that valves are dry and internally protected against rust and corrosion.
   2. Protect valves against damage to threaded ends and flange faces.
   3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves according to the following:
   1. Do not remove end protectors, unless necessary for inspection; then reinstall for storage.
   2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

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

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

1.7 PROJECT CONDITIONS

A. Verify existing utility locations and meters. Contact utility locating service.

B. Verify that it is possible to install water service piping to comply with original design and referenced standards.

C. Site Information: Reports on subsurface condition investigations made during design of Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.

D. Obtain necessary connection permits with local water company as required.

E. Obtain necessary street excavation and encroachment permits from the City of Rosemead Dept. of Public Works.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate piping materials, sizes, entry locations, and pressure requirements with building water distribution piping.

B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building fire-protection water piping.

C. Coordinate with other site utility work.

PART 2 - PRODUCTS

2.1 PIPES AND TUBES

A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.

B. PVC Plastic, Socket Fittings: ASTM D 2466, Schedule 40.

C. PVC Plastic, Fire Service Pipe: UL 1285 and AWWA C900, Class 200 or 150 as noted on plans. Include elastomeric seal according to ASTM F 477.

D. Pipe sizes up to 2 inches shall be copper water tubing, Type K hard, ANSI H23.1, ASTM B 88, IAPMO IS. Muller Brass, Cambridge-Lee Halstead, or equal. An approved protective wrap shall be used to completely isolate and protect all underground copper tubing and extend past the surface a minimum 12 inches. The excess wrapping shall be trimmed down and taped to copper tubing with 10 mill PVC pipe tape at grade level of concrete or asphalt.

B. Ductile-Iron, Push-on-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111.

2.2 PIPE AND TUBE FITTINGS

A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.

B. Copper Fittings: ASME B16.22; wrought-copper, solder-joint pressure type.

C. PVC Plastic, Socked Fittings: ASTM D2466, Schedule 40.

D. Ductile-Iron, Push-on-Joint Fittings: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and rubber compression gaskets according to AWWA C111.

2.3 JOINING MATERIALS

A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.

B. Solder Filler Metal: ASTM B 32, Alloy Sn95, Alloy Sn94, or Alloy E, with 0.10 percent maximum lead content.

C. Primers for PVC Piping Solvent-Cement Joints: ASTM F 656.

D. Solvent Cement for PVC Piping Solvent-Cement Joints: ASTM D 2564.

2.4 PIPING SPECIALTIES

A. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals to prevent galvanic action and corrosion.
   1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
   2. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C). Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.
   3. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum pressure to suit system pressures.
   4. Dielectric-Flange Insulation Kits: Field-assembled companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
      a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure to suit system pressures.
   5. Dielectric Couplings: Galvanized-steel couplings with inert and non-corrosive thermoplastic lining, with threaded ends and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
   6. Dielectric Nipples: Electroplated steel nipples with inert and non-corrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig (2070-kPa) working pressure at 225 deg F (107 deg C).

2.5 POLYETHYLENE ENCASEMENT

A. Polyethylene Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

2.6 VALVES

A. All Gate Valves, 4-Inch NPS (DN80) and Larger in size shall conform to AWWA Standard Specifications C500. All valves, including those over 12", shall be rated to a minimum working pressure of 200 psi. All valves shall be iron body, bronze mounted, double-disk, parallel scat gate valves. All valves shall open by turning the stem counterclockwise. Buried valves shall be non-rising type with O-ring seal equipped with 2 inch square operating nut, and shall be bituminous coated. End connections shall be flanged, or mechanical joint as required for the type of pipe used. Buried valves shall have stem extensions to place operating nut within 6" of top of valve box.

B. Valve Boxes shall be precast concrete with cast iron traffic rated cover with lettering "WATER", bottom section with base of size to fit over valve and barrel approximately 5 inches (125 mm) in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.
   1. Provide steel tee-handle operating wrench with each valve box. Include tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut. After installation of valve box cover and after installation of adjacent paving, if any, covers shall be sandblasted or wire-brushed as necessary and painted with bituminous black paint, unless another color is required by the Architect.

C. Indicator Posts: UL 789, FM-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve. Posts above and including connection to riser shall be sandblasted, if necessary, after installation and painted red, unless another color is required by the Architect.

D. Tapping Sleeve and Tapping Valve: Complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. Use sleeve and valve compatible with tapping machine.
   1. Tapping Sleeve: Cast- or ductile-iron, 2-piece bolted sleeve with flanged outlet for new branch connection. Sleeve may have mechanical-joint ends with rubber gaskets or sealing rings in sleeve body. Include sleeve matching size and type of pipe material being tapped and of outlet flange required for branch connection.

E. No ball valves shall be used for underground installation.

2.7 BACKFLOW PREVENTERS

A. General: Manufactured backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.

B. Working Pressure: 200 psig (1380 kPa) minimum, unless otherwise indicated.

C. 2-Inch NPS (DN50) and Smaller: Bronze body with threaded ends.

D. Interior Lining: AWWA C550, epoxy coating for backflow preventers with cast-iron or steel body.

E. Interior Components: Corrosion-resistant materials.

F. Strainer on inlet if strainer is indicated.

G. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

H. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous-pressure application.
   1. Pressure Loss: 12 psig (83 kPa) maximum through middle third of flow range.
   2. Double Detector Check Assembly: 15 psi (103.75 kPa) entry loss.

I. Exterior Finish: Red or yellow (as directed by Water Purveyor or local Fire Department) alkyd-gloss enamel paint. Entire device above and including connection to riser shall be sandblasted, if necessary, after installation and re-painted.

Manufacturer	Model	Size
Cia-Val	RP-LEX	2",2 1/2",3",4",6",8",10"
Cia-Val	RP-2	3/4",1",1-1/4",1-1/2"
Cia-Val	RP4	6 "
Febco	825YD2	2-1/2",3",4",6",8",10"
Febco	825Y	3/4",1",1-1/4",1-1/2",2"
Febco	825YA	3/4",1",1-1/2",2"
Febco	845	3/4",1"
Mueller	H-9506	4",6",8",10"
Orion	80-0069	1-1/2"
Orion	BRP	3/4,1”,3",4"
Orion	9-2929	2 "
Rain Bird	RPA-075-R	3/4"
Rain Bird	RPA-100-R	1”
Rain Bird	RPA-125-R	1-1/4"
Rain Bird	RPA-150-R	1-1/2"
Rain Bird	RPA-200-R	2"
Rain Bird	RPA-250-R	2-1/2"
Rain Bird	RPA-400-R	4 "
Rain Bird	RPA-600-R	6"

Rain Bird	RPA-800-R	8"
Rain Bird	RPA-1000-R	10"
Watts	909 PCQT	3/4"-2"
Watts	909HWQT	3/4",1",1-1/4",1-1/2",2"
Watts	909 PCRW	2-1/2"-10"
Watts	909 RW Bronze	2-1/2",3"
Watts	009QT	3/4",1",1-1/4",1-1/2",2"
Watts	009SSQT	3/4",1",1-1/4",1-1/2",2"
Wilkins	975XL	3/4",1",1-1/4",1-1/2",2"
Wilkins	375(SM)	1/2", 3/4",1",1-1/4",1-1/2",2"
Wilkins	375A	2 1/2", 3", 4", 6", 8", 10"
Wilkins	375ADA	2 1/2", 3", 4", 6", 8", 10"
Wilkins	450DA	4", 6", 8", 10"

2.7 FIRE DEPARTMENT CONNECTIONS

A. Exposed Fire Department Connections: UL 405, cast-brass body, with thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch- (460-mm-) high brass sleeve; and round escutcheon plate.
   1. Connections: Two 2-1/2-inch NPS (DN65) inlets and 6-inch NPS (DN150) outlet.
   2. Inlet Alignment: Inline, horizontal.
   3. Finish Including Sleeve: Polished chrome-plated.
   4. Escutcheon Plate Marking: "AUTO SPKR."

2.8 ANCHORAGES

A. Concrete Reaction Backing: Portland cement concrete mix, 2000 psig (13.8 MPa).
   1. Cement: ASTM C 150, Type I.
   2. Fine Aggregate: ASTM C 33, sand.
   3. Coarse Aggregate: ASTM C 33, crushed gravel.
   4. Water: Potable.

2.9 IDENTIFICATION

A. Refer to Division 2 Section "Earthwork" for underground warning tape materials.

B. Arrange for detectable warning tapes made of solid blue film with metallic core and continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."

C. Nonmetallic Piping Label: Engraved, plastic-laminate label at least 1 by 3 inches (25 by 75 mm), with caption "CAUTION--THIS STRUCTURE HAS NONMETALLIC WATER-SERVICE PIPING," for installation on main electrical meter panel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Section 31 20 00 "Earthwork" for excavation, trenching, and backfilling.

B. Refer to Section 32 12 16 "Asphalt Concrete Paving" for cutting and patching of existing asphalt paving.

C. Refer to Section 32 13 13 "Concrete Paving" for cutting and patching of existing concrete paving.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping NPS 2 to NPS 16 shall be the following:

1. Soft copper tube, ASTM B 88, Type K and B 251; wrought-copper, solder-joint fittings; and brazed joints.
2. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed, or mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.

F. Underground water-service piping NPS 30 shall be the following:

1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed, or mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints

3.3 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, 3-Inch NPS (DN80) and Larger: AWWA, gate valves, non-rising stem, with valve box.
2. Underground Valves, 4-Inch NPS (DN100) and Larger: UL/FM, gate valves, non-rising stem, with indicator post.

3.4 JOINT CONSTRUCTION

A. Ductile-Iron Piping, Gasketed Joints for Fire-Service Piping: According to UL 194 and AWWA C600.

B. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, OD, and system working pressure. Refer to "Piping Systems - Common Requirements" Article below for joining piping of dissimilar metals.

3.5 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Install piping as indicated, unless deviations to layout are approved in advance by the Architect or USC.

B. Install components with pressure rating equal to or greater than system operating pressure.

C. Install piping free of sags and bends.

D. Install fittings for changes in direction and branch connections.

G. Piping Connections: Unless otherwise indicated, make piping connections as specified below:

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

3.6 SERVICE ENTRANCE PIPING

A. Extend water-service piping and connect to water-supply source and building water piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water piping systems when those systems are installed.

B. Sleeves and mechanical sleeve seals are specified in Drawings.

C. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.7 PIPING INSTALLATION

A. Make connections larger than 2-inch NPS (DN50) with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to manufacturer's written instructions.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.
4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.

B. If hot tap is not possible, install cut-in tee with C-110 fittings.

C. Comply with NFPA 24 for fire-protection water-service piping materials and installation.

D. Install ductile-iron piping according to AWWA C600.

1. Encase piping with PE film according to ASTM A 674 or AWWA C105.

2. Install encasement per manufacturer's written instructions. Close seams and overlaps in the polyethylene tubes with polyethylene compatible adhesive tape. The tape shall be approximately two inches wide and shall have the ability to bond securely to a metal surface and the polyethylene material. Repair all rips, tears and other damage with suitable adhesive tape.

E. Bury piping with depth of cover over top at least 30 inches (750 mm) and according to the following:

1. Under Driveways: With at least 36 inches (900 mm) cover over top.

2. If trenching before rough grading is completed would result in a lesser depth of cover than specified above, then trenching for water piping installation shall not be done until the specified minimum cover depth can be achieved. If construction traffic will be allowed to pass over completed water piping installations prior to finish paving, then a protective pavement blanket at least equivalent to the final pavement and base thickness shall be constructed within the vehicle access area for a minimum distance of three feet on either side of the pipe. As an alternative to the temporary pavement blanket, the water pipe shall be installed at a minimum of two (2) feet deeper than specified within construction traffic areas.

3.8 ANCHORAGE INSTALLATION

A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
   1. Gasketed-Joint, Ductile-Iron, Potable-Water Piping: According to AWWA C600.
   2. Fire-Service Piping: According to NFPA 24.

B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.9 VALVE INSTALLATION

A. General Application: Use mechanical-joint-end valves for 3-inch NPS (DN80) and larger underground installation. Use non-rising-stem UL/FM gate valves for installation with indicator posts.

B. AWWA-Type Gate Valves: Comply with AWWA C600. Install underground valves with stem pointing up and with cast-iron valve box.

C. UL/FM-Type Gate Valves: Comply with NFPA 24. Install underground valves and valves in pits with stem pointing up and with vertical cast-iron indicator post.

3.10 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install fire department connection of type and features indicated.

3.11 IDENTIFICATION INSTALLATION

A. Install continuous plastic underground warning tape during back-filling of trench for underground water-service piping. Locate 6 to 8 inches (150 to 200 mm) below finished grade, directly over piping.

3.12 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.
   1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits.

C. Prepare reports for testing activities.

3.13 CLEANING

A. Clean and disinfect water distribution piping as follows:
   1. Purge new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
   2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities, use procedure described in AWWA C651 or as described below:
      a. Comply with NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
         1) Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine. Isolate system or part thereof and allow to stand for 24 hours.
         2) Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
         3) Following allowed standing time, flush system with clean, potable water until chlorine does not remain in water coming from system.
         4) Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports for purging and disinfecting activities.

END OF SECTION

SECTION 333100

SANITARY SEWER

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sanitary drainage piping, fittings and accessories.

B. Connection of building sanitary sewer drainage system to site sewer systems

C. Cleanout access.

1.2 REFERENCES

A. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

B. ASTM D3034 - polyvinyl chloride (PVC), SDR 35, for solvent-cemented or gasketed joints.

C. ASTM C700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated

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

1.3 REGULATORY REQUIREMENTS

A. Conform to Section 306, Standard Specifications for Public Works Construction, for materials and installation of Work of this Section.

1.4 SUBMITTALS

A. Shop drawings indicating dimensions, locations and elevations of manholes, cleanouts and sub-surface structures.

B. Product data for pipe and pipe accessories.

C. Inspection and test reports specified

1.5 PROJECT RECORD DOCUMENTS

A. Accurately record location of existing and proposed pipe runs, connections, manholes, cleanouts and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 - PRODUCTS

2.1 SEWER PIPE MATERIALS

A. Gravity-Flow, Non-pressure Plastic Pipe: Polyvinyl Chloride (PVC) Sewer Pipe and Fittings: ASTM D 3034, SDR 35, for gasketed joints. Gaskets: ASTM F 477, elastomeric seal.

B. PVC pipe is for outside conditions.

C. Vitrified Clay Pipe (VCP) - pipe shall be "extra strength VCP" and shall comply with Section 207-8 of the Standard Specifications for Public Works Construction. Pipe shall be manufactured in accordance with ASTM C-700 and installed in accordance with ASTM C-12. Joints for Vitrified Clay Pipe shall comply with Section 208-2.3 of SSPWC and manufactured in accordance with ASTM C-425. All VCP pipe, fittings and couplings shall be clearly marked at an interval not to exceed 5 feet as follows:
   1) Nominal pipe diameter.
   2) VCP classification.
   3) Company, plant, shift ASTM, and date designation.
   4) Service designation or legend.

D. Reinforced Concrete Pipe and Fittings: ASTM C76 (ASTM C76M), Class III, Wall B, for gasketed joints.

   1) Gaskets: ASTM C443 (ASTM C443M), rubber.

E. Hub and Spigot, Cast-Iron Soil Pipe and Fittings: ASTM A74, Service class, gray cast iron for gasketed joints. Include ASTM C564, rubber compression-type gaskets.

F. Backwater Valves: Gray iron.

G. Cleanouts: PVC.

H. Corrosion-Protection Piping Encasement: LLDPE film.

I. Manholes: Standard precast concrete.
   1. Resilient pipe connectors.
   2. Reinforced-concrete grade rings.
   3. Protective coating.
   4. Manhole frames and covers, with protective coating.

5. Manhole cover inserts.

2.2 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.

B. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in required "T", bends, elbows, cleanouts, reducers, traps and other configurations required.

C. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D3034, SDR 35, for solvent-cemented or gasketed joints.

1. Gaskets: ASTM F477, Elastomeric seals.
2. Primer: ASTM F 656.
3. Solvent Cement: ASTM D 2564

2.3 CLEANOUTS

A. Lid and Frame: Cast iron construction, removable lid, closed checkerboard grill lid design; nominal lid and frame diameter as required for pipe sizes. [SPPWC 204-2]

B. Manholes: SPPWC Standard Drawing 200-3.

2.4 FILL MATERIAL

A. Bedding and Fill: As specified in Section 312000 “Earthwork”

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut, or excavation base is ready to receive work, excavations, dimensions and elevations are as indicated on drawings.

B. Beginning of installation means acceptance of existing conditions.

C. Verify that existing invert elevations on site will allow proper tie in to new work with proper positive slope. Ascertain accuracy prior to trenching and installation of sanitary sewer system.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with approved fill material.

B. Remove large stones or other hard matter that could damage sewer pipe or impede consistent backfilling or compaction.

3.3 INSTALLATION - PIPE

A. Prior to commencing Work, Contractor shall pothole existing utilities at points of connection and verify the joining invert shown on plan. Notify Architect in event of discrepancies.

B. Install pipe, fittings and accessories in accordance with Section 306, SSPWC and manufacturer's instructions. Seal joints watertight.

C. Concrete Pipe and Fittings: Install according to ACPA "Concrete Pipe Handbook". Provide the following seals:

1. Round Pipe and Fittings: ASTM C443 (ASTM C443M), rubber gaskets.
2. Elliptical Pipe: ASTM C877 (ASTM C877M), Type I, sealing bands.
3. Arch Pipe: ASTM C877 (ASTM C877M), Type I, sealing bands.

D. All below grade piping consisting of ferrous metals shall be given a high-quality protective coating, such as 18-mil plastic tape, extruded polyethylene, coal-tar enamel, or Portland cement mortar. Below-grade metals should be electrically insulated (isolated) from above-grade metals by means of dielectric fittings in ferrous utilities and/or exposed metal structures breaking grade.

E. Place pipe on bedding as specified in Section 312000.

F. Lay pipe to slope gradient noted on Drawings with maximum variation from true slope of 1/8 inch in 10 feet.

G. Do not displace or damage pipe when compacting.

H. Connect to site sewer outlet system through installed sleeves.

I. Do not cover joints until lines have been tested and approved.

3.4 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Establish elevations and pipe inverts.

C. Mount lid and frame level in grout secured to top cone section to elevation indicated.

3.5 PROTECTION

A. Protect pipe cover from damage or displacement until backfilling operation is in progress.

3.6 TESTING

A. After installation, test each sanitary drain and/or sewer and each section between successive manholes for either infiltration or exfiltration. Test shall be conducted in accordance with Section 306 - Underground Conduit Construction of the Standard Specifications for Public Works Construction.

B. Where excessive ground water is encountered test the pipeline for infiltration.

C. When infiltration or exfiltration exceeds allowable amounts as set forth in the Section 306 formula, perform repairs or replacements as necessary to comply with the required limits.

END OF SECTION

SECTION 334300
LANDSCAPE DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work as required to make a complete Landscape Drainage installation, as shown on the Contract Drawings, and as specified herein this Section.

B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
   1. Area Drain – Landscape Areas, including housing, grate, and fittings.
   2. Piping Materials and Fittings
   3. Miscellaneous Materials.

C. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 31 22 19 – Landscape Grading.
   2. Section 32 91 13 – Soil Preparation.
   3. Section 32 94 00 – Landscape Planting Accessories.

1.2 DEFINITIONS AND APPLICABLE STANDARDS

A. References:
   1. ASTM – American Society for Testing and Materials.
   2. ANSI – American National Standards Institute.
   3. CBC – California Building Code.

B. Material Specification Standards:
   1. ASTM C33 – Standard Specification for Concrete Aggregates.

C. Material Testing Standards:
   1. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   2. ASTM D698 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
   3. ASTM D1557 – Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

D. Definitions:
   1. ABS – Acrylonitrile-Butadiene-Styrene plastic.
   2. HDPE – High-Density Polyethylene Plastic.
   3. PE – PolyEthylene plastic.
   4. PP – PolyPropylene plastic.

5. PS – PolyStyrene plastic.
6. PVC – PolyVinyl Chloride plastic.
7. Subdrainage – Drainage system that collects and removes subsurface or seepage water.
8. psi – Measurement, in pounds per square inch.

1.3 SUBMITTALS

A. General: Submit each item in this Article in four (4) bound Submittal Booklets and provide four (4) sets of Material Samples for review by the Landscape Architect.

B. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.

C. Product/Material Data. Submit available Product Data, manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of material and product indicated herein this Section.
   1. Area Drain (landscape), including housing, grate, and fittings.
   2. Piping Materials and Fittings
      a. Perforated Piping.
      b. Non-Perforated (solid-wall) Piping.
   3. Geotextile Filter Fabric.
   4. Manufacturer's technical information for each material specified including installation instructions and recommendations, as applicable.

D. Material Samples: Submit Material Sample sets of each type of finish indicated for verification. Provide Material Sample sets for each color and texture to be used, utilizing the same tools and techniques for actual project application, to demonstrate the full range of variations expected in these characteristics.
   1. Piping Material and Fittings, 12" long section, of each type
      a. Perforated Piping.
      b. Non-Perforated (solid-wall) Piping.

E. Scaled Shop Drawings: Submit manufacturer's Shop Drawings for each Product/Material as indicated.

F. Field-Constructed Mock-ups: Not applicable.

G. Qualification Data: Submit names for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience on similar Landscape Drainage installations.

H. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.

I. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.

1.4 QUALITY ASSURANCE AND CONTROL

A. Materials and Work shall be in accordance with the State Codes and Specifications and other criteria herein specified.

B. Installer Qualifications: Engage an experienced Installer who has completed in the last two (2) years at least three (3) installations similar in material, design, and extent to that indicated for this Project, and whose work has resulted in construction with a record of successful in-service performance.

C. Single-Source Responsibility: Obtain each type of landscape drainage unit from a single source with resources to provide products and materials of consistent quality in appearance and physical properties, without delaying the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in a timely manner to ensure uninterrupted progress of the Work. Schedule material deliveries to minimize jobsite storage.

B. Units shall be in “new” condition when ready for installation. It shall be the responsibility of the Contractor to install “factory condition” units.

C. All containerized products shall be delivered to the site in manufacturer's original, unopened, undamaged, legibly labeled containers, with identification labels intact. All pipe to be delivered bound securely to prevent damage. Supply pallets as required to protect products.

D. Storage: Protect materials from damage, water and rust. Store pipes on beds which are full length of pipe. Protect plastic materials from direct sunlight.

E. Pipe: Cap openings to prevent entry of dust, debris and other foreign matter.

1.6 COORDINATION, SCHEDULING AND OBSERVATIONS

A. Notify the Contractors performing Work related to installation of Work under this Section in ample time so as to allow sufficient time for them to perform their portion

of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section. Coordinate items of other trades to be furnished and set in place.

B. Project Conditions:
   1. Environmental Requirements: Comply with Manufacturer's recommendations of environmental conditions affecting product installation requirements.
   2. Wind and Weather Criteria:
      a. Perform installation of Landscape Drainage only when weather and soil conditions are suitable in accordance with locally accepted practices.

C. Protection of Utilities:
   1. Provide temporary support and protection of underground and surface utility structures, drains, services and other improvements to remain.
   2. Where grade or alignment of pipe is obstructed by existing utility structures such as conduits, ducts or pipes, permanently support, relocate, remove or reconstruct the obstruction.
   3. Restore all damaged improvements to original condition at no additional cost to Owner.

D. Field Measurements and Conditions:
   1. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
   2. Excavation: When conditions detrimental to installing landscape drainage Work is encountered, such as foundations or obstructions, cease installation operations and notify Landscape Architect for further direction.
   3. Grades and Levels: Establish and maintain required levels, grade elevations, and proper clearances. Review installation procedures and coordinate Work herein this Section with other Work affected.
   4. Concealed Work: Verify locations of existing stub-outs to receive area drains. Verify and locate existing pipes and structures to be coordinated with landscape drainage Work.
   5. Traffic Control: Maintain access for vehicular, bicycle, and pedestrian traffic, as required, for other construction activities during installation of Flagpoles. Access shall also be unobstructed and maintained at all times to allow for entry and exit of emergency vehicles.
   6. Protection: Protect adjacent finished surfaces prior to application. Maintain protection until completion of Work.
   7. Notification: Submit written notification of all discrepancies in the Contract Drawings or existing conditions which preclude successful installation of landscape drainage Work as specified.
   8. The outfall for any subsurface drainage pipe, drainage mat, trench drain, or slot drain used shall be coordinated with the site drainage.
   9. Where Prefabricated Drainage Composite Matting is installed in conjunction with a waterproofing product, the Matting must be compatible with the

waterproofing product and installed by methods acceptable to the waterproofing product manufacturer.

E. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective Work under this Section at any time during progress of Work. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

1.7 SUBSTITUTIONS

A. Consideration: Materials to be considered equal to the Materials indicated herein this Section shall be reviewed by the Landscape Architect. Materials with equal performance characteristics produced by other Manufacturer's and/or Distributors may be considered, providing deviations in dimensional size, color, composition, operation, and/or other characteristics do not change the design concept, aesthetic appearance, nor intended performance, as solely judged by the Landscape Architect. The burden of proof on product equality is on the Contractor.

B. Specific reference to Manufacturer's names and products specified herein are used as standards of quality. This implies no right to the Contractor to substitute other materials without prior written approval by the Landscape Architect for Work under this Section.

C. Materials substituted and installed by the Contractor, without prior written approval by the Landscape Architect, may be rejected. Contractor shall not be entitled to be compensated by the Owner where the Contractor has installed rejected substitutions without receiving prior written approval.

D. Contract Price: Substituted Materials under this Section shall not increase the Contract price.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Drain Piping and Fittings:
   1. Perforated and Non-Perforated (solid wall) Polyvinyl Chloride (PVC) Tubing:
      a. Type: ASTM D3034, SDR 35 tubing and fittings.
      b. Type: ASTM D1785, PVC 1120-1220, Schedule 40.
      c. Perforations: 3/8 in. diameter, four inches (4") apart center-to-center longitudinally, in two (2) rows, 120-degrees apart.
   2. Perforated and Non-Perforated (solid wall) PolyEthylene Tubing:

a. Type: ASTM F405 corrugated tubing and fittings, for less than ten-inches (10") in diameter, and ASTM F667 for ten-inch (10"), twelve-inch (12"), and fifteen-inch (15") diameters.
b. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
    1) Advanced Drainage Systems (ADS), Inc.
    2) or equal, as approved by the Landscape Architect.

2.2 MANUFACTURED UNITS

A. Area Drain (Landscape Applications):
1. General: Area Drain (Landscape Applications) shall consist of the complete assembly, including housing, grate, and fittings necessary to connect to sub-surface piping.
2. Housing:
    a. Drain Basin Structure
        1) Size:
            a) 12".
        2) Shape: square
            a) Round surface profile.
    b. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
        1) 1). *Nyloplast*, ADS, Hilliard, OH.
        2) 2). or equal, as approved by the Landscape Architect.
3. Grate:
    a. Style:
        1) Flat-style Grate, sized to fit Drain Basin Structure.
    b. Material/Color:
        1) Molded Polyethylene/Black.
    c. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
        1) To be provided by Manufacturer of Area Drain Housing.
        2) or equal, as approved by the Landscape Architect.
4. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
    a. Advanced Drainage Systems (ADS), Inc.
    b. or equal, as approved by the Landscape Architect.
5. Grate:
    a. General: Grate shall be of the same manufacturer as the housing. Provide locking-device hardware per manufacturer.
        1) Perforated Galvanized Steel, 16 gage, ADA-compliant.
        2) Perforated Stainless Steel, 16 gage, grade 304, ADA-compliant.
        3) Slotted Galvanized Steel, 16 gage.
        4) Slotted Stainless Steel, 16 gage, grade 304.
        5) Slotted Ductile Iron, meeting ASTM A536, Grade 64-45-12, ADA-compliant, e-coated to prevent rust.

6) Mesh Galvanized Steel, 13 gage.
7) Mesh Stainless Steel, 13 gage, grade 304.
8) Ornamental Ductile Iron, meeting ASTM A536, Grade 64-45-12, ADA-compliant, e-coated to prevent rust.

b. Load Class:
1) Meet Load Class A, 3,500 lbs., 70 psi.
2) Meet Load Class B, 28,100 lbs, 581 psi.
3) Meet Load Class C, 56,000 lbs., 1,162 psi.
4) Meet Load Class D, 90,000 lbs., 1,859 psi.
5) Meet Load Class E, 135,000 lbs, 2,788 psi.

6. Cleanouts:
7. Accessories: Provide as required to complete assembly.
a. End Plates.
b. Outlet Plates.
c. Strainer.
d. Locking Devices.
e. Sealant.
f. Sidewall Extensions.
g. Installation Devices.
h. Catch Basins.

B. Prefabricated Drainage Composite Matting:
1. General: High flow, two (2) -layer composite polyester non-woven filter fabric, bonded to a compression resistant nylon matting of open, three-dimensional construction, with a minimum core thickness of .40 inches, and a minimum compressive strength of 15,000psi. Provide manufacturer-provided adhesives, and end-out or side-out piping connectors, as needed, to connect Prefabricated Drainage Composite Matting to subsurface discharge piping.
2. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
a. *#6000XL MiraDRAIN,* Carlisle Coatings and Waterproofing, Wylie, TX.
b. or equal, as approved by the Landscape Architect.

2.3 BACKFILL MATERIALS

A. Sand Backfill: Coarse washed granular sand material naturally produced by the disintegration of rock, free of organic material, mica, loam, clay and other deleterious substances to be thoroughly suitable for pipe bedding, meeting ASTM C33, coarse aggregate, as modified below:
1. Properties and Gradation: Conform to the grading requirements of ASTM C33 with modifications as follows:

Grading Requirements for Coarse Sand ASTM C33 Sieve Analysis	
Sieve Size	Percent (%) Passing

No. 10	95
No. 30	<5
No. 50	<1

2. Sieve accordingly per ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

B. Aggregate Backfill: Clean, washed, angular, neutral pH, no salinity, free from deleterious or foreign matter, meeting ASTM C33, as modified below:
1. Properties and Gradation: Conform to the grading requirements of ASTM C33 with modifications as follows:

Grading Requirements for Aggregate Backfill ASTM C33 Sieve Analysis	
Sieve Size	Percent (%) Passing
2”	100
¾”	70-100
3/8”	40-100
No. 4	25-50
No. 8	15-35
No. 30	5-18
No. 50	0-10
No. 200	0-3

2. Sieve accordingly per ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

C. Soil Backfill: Clean, native soil, free from rocks and deleterious or foreign matter

2.4 MISCELLANEOUS MATERIALS

A. Support for Trench and Slot Drain Housings:
1. Concrete: Composed of Portland cement, coarse and fine aggregate, and water, mixed in proportions to attain a 28-day compressive strength of not less than 2,500 PSI, complying with ASTM C94.
2. Reinforcement Bars: Meet ASTM A615, Grade 60 deformed, clean and free of rust, dirt, grease or oils.

3. Tie Wire: 16-gauge plain cold-drawn steel conforming to ASTM A82, clean, and free of rust, dirt, grease or oils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Verify exact locations and quantity of drains relative to planting areas, paving areas, and adjacent to paving, prior to beginning of Work.
   2. Identify required lines, levels, contours, and datum.
   3. Immediately report discrepancies to Landscape Architect prior to installation of landscape drainage Work.
   4. Verify substrate conditions to be acceptable for product installation in accordance with manufacturer's instructions. Do not proceed with drainage installation until substrate conditions are acceptable for compliance with manufacturer's warranty requirements.

B. Deviations: Make no deviations from specified line or grade without written acceptance of change by the Landscape Architect.

3.2 PREPARATION

A. Adjacent Surfaces Protection: Protect adjacent Work areas and finish surfaces from damage during installation operations.

B. Surface Preparation for Prefabricated Drainage Composite Matting:
   1. Prepare surfaces to receive Prefabricated Drainage Composite Matting. Surfaces shall be smooth, free of depressions, voids, protrusions, clean, and free from surface contaminants that may impair the performance of drainage and Manufacturer's warranty requirements.
   2. Clean substrate that is to receive drainage. Remove loose debris and other harmful contaminants that will affect performance of the Prefabricated Drainage Composite Matting.
   3. Refer to Manufacturer's printed instructions for additional applicable preparation requirements.

3.3 INSTALLATION

A. Examination: Verify exact locations and quantity of all drains relative to planting areas and adjacent to paving, prior to beginning of Work. Identify required lines, levels, contours, and datum. Immediately report to Landscape Architect all discrepancies found prior to installation of drains.

1. Deviations: Make no deviations from specified line or grade without written acceptance of change by Landscape Architect.

B. Trenching and Backfilling:
   1. General: Conform to applicable "Earthwork" Sections and as supplemented herein. Hand trim excavations to required elevation. Do not over-excavate.
   2. Obstructions and Debris: Remove hardpan, rock, mud, quicksand, debris or other unsuitable bedding material. Further excavate the trench a suitable limit as directed by the Engineer. Backfill with import material approved by the Engineer that will provide adequate pipe bedding.
   3. Compaction of Backfill: per Geotechnical Report.
   4. Backfill:
      a. Backfill the remaining trench with excavated material to 12 in. above the top of the pipe. If excavated material is unsuitable for compaction, use imported suitable material.
      b. Do not permit sand backfill material to mix with structural backfill within the sub-drain area.

C. General Piping Installation:
   1. Install as detailed in the Contract Drawings and in accordance with the manufacturer's current printed specifications.

D. Sub-surface Drainage System (Burrito/French Drain):
   1. Preparation of Trench: Accurately excavate trench as shown on the Contract Drawings.
   2. Geotextile Filter Fabric: Place fabric in bottom of trench and extend up sides and beyond trench. Overlap twelve-inches (12”) at ends of roll.
   3. Drain Rock and Pipe: Install bedding portion of drain rock and bed pipe in place. Wrap pipe with Filter Fabric. Do not damage or displace geotextile filter fabric on sides of trench.
   4. Review: Prior to installing remaining drain rock backfill, request review by Landscape Architect for progress of the Work.
   5. Closing: Upon acceptance, add remaining drain rock and lap over the ends of the filter fabric as shown on the Contract Drawings.
   6. Soil Backfill: Backfill with permeable planting soil mix to a minimum depth of six-inches (6”) above filter fabric as shown on Contract Drawings.

E. Prefabricated Drainage Composite Matting:
   1. Vertical Applications:
      a. Position the Prefabricated Drainage Composite Matting with the flat side against the vertical surface (wall, structure, etc.) and the filter fabric on the Matting facing towards the soil/drainage side. Contact adhesive or a washer-headed concrete nail may be used to attach the Matting against the vertical surface.
         1) Where a waterproofing membrane is installed on the vertical surface, affix the Matting over the waterproofing membrane, being careful not to puncture the membrane.

b. Connecting Adjacent Panels: Connect adjacent panels at the longitudinal edge by pulling the filter fabric back to expose the flange. The panel edge shall be butted to the edge of the adjacent panel dimple to dimple or the edge of the next panel may be placed over two dimples and interlocked. Panel ends are to be attached in the same manner. Connections should be completed in shingle fashion so that moisture will flow with the overlap and not against it. Overlap fabric in the direction of water flow. Cover all terminal edges with the filter fabric flap by tucking in behind the core. Avoid soil intrusion into the flow channels.

c. Discharge Connections: Connect to discharge piping per Manufacturer's recommendation.

d. Backfill: Perform backfill operations along Prefabricated Drainage Composite Matting per Manufacturer's recommendation.

3.4 FIELD QUALITY CONTROL

A. Tests: Field density test for compaction.

B. Manufacturer's Field Service: Installation of Trench Drains.

3.5 CLEANING AND PROTECTION

A. General: Keep clean and protect sub-drainage system until commencement of Work under, Section 329113 - Soil Preparation.

B. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with Manufacturer's instructions.

C. Sediments: Temporarily plug all outlets to prevent construction debris and sediments from entering drainage system. Vacuum all sediments from trench drains periodically and at the completion of Work. Do not hose (water) sediments into drainage system.

D. Sub-Drainage: Monitor sub-drainage systems and immediately identify problems with drainage. Make adjustments as necessary to maintain proper sub-drainage flow.

E. Protection: Protect installed products finished surfaces from damage during construction.

END OF SECTION