Beverly Gardens Park

City of Beverly Hills, CA

Block #13:
Hunter and Hounds Garden

SPECIFICATIONS

100% CD / BID SET
Dec. 22, 2016

MIA LEHRER+ASSOCIATES
URBAN DESIGN LANDSCAPE ARCHITECTURE

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SECTION 011000

SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Work restrictions.
5. Specification and drawing conventions.
6. Miscellaneous provisions.

1.2 PROJECT INFORMATION

A. Project Identification: Beverly Gardens Park

1. Project Location: Block 13, Hunter and Hounds Garden, Beverly Hills, CA

B. Owner: City of Beverly Hills

1. Owner's Representative: Ken Pfalzgraf

C. Landscape Architect: Mia Lehrer + Associates

D. Contractor: TBD.

E. Project Web Site: A project Web site administered by Owner and Contractor will be used for purposes of managing communication and documents during the construction stage.

1. See Division 01 Section "Project Management and Coordination" for requirements for using Project Web site.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Restoration of D.G pathways within the Garden. New concrete mow curbs and stabilized decomposed granite. The central three planting areas will be raised using stacked stone. The walls have maximum height of 18” and minimum height of 15”.

2. Protection of existing specimen plants and trees. Relocation of cactus and succulents, by others.

3. A family of low level light fixtures will be used at the pedestrian paths while accent light fixtures will up-light specimen trees. Step lights are installed in the raised wall area which will illuminate the inner paths.

4. The existing plant collection will be enhanced by the addition of more succulent and cactus species.

B. Type of Contract.

1. Project will be constructed under a single prime contract.
2. Project will be constructed under coordinated, concurrent multiple contracts.

1.4 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

C. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to areas within the Contract limits indicated.
2. Driveways, Walkways and Entrances: Keep driveways and public sidewalks available to Owner, Owner's employees, emergency vehicles, and the public at all times. Do not use these areas for parking or storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.5 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 8 a.m. to 6 p.m., Monday through Friday, unless otherwise indicated.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

F. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.6 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012500

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form:
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

i. Research reports evidencing compliance with building code in effect for Project,
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through City Representative of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 working days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Requested substitution will not adversely affect Contractor's construction schedule.
c. Requested substitution has received necessary approvals of authorities having jurisdiction.
d. Requested substitution is compatible with other portions of the Work.
e. Requested substitution has been coordinated with other portions of the Work.
f. Requested substitution provides specified warranty.

g. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed unless otherwise indicated.

C. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 calendar days after the Notice to Proceed.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Requested substitution will not adversely affect Contractor's construction schedule.
e. Requested substitution has received necessary approvals of authorities having jurisdiction.
f. Requested substitution is compatible with other portions of the Work.
g. Requested substitution has been coordinated with other portions of the Work.
h. Requested substitution provides specified warranty.
i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 013300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
2. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
3. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Landscape Architect and City Representative and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.

a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.

b. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect and City Representative reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. City Representative will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect and City Representative.
3. Include the following information for processing and recording action taken:

a. Project name.
b. Date.
c. Name of Architect.
d. Name of City Representative.
e. Name of Contractor.
f. Name of Landscape Architect.
g. Name of subcontractor.
h. Name of supplier.
i. Name of manufacturer.
j. Submittal number or other unique identifier, including revision identifier.

1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

k. Number and title of appropriate Specification Section.
l. Drawing number and detail references, as appropriate.

m. Location(s) where product is to be installed, as appropriate.
n. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect or City Representative observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

   a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect and City Representative.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect and City Representative will discard submittals received from sources other than Contractor.

   a. Transmittal Form for Paper Submittals: Use facsimile of sample form included in Project Manual.
   b. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

      1) Project name.
      2) Date.
      3) Destination (To:).
      4) Source (From:).
      5) Name and address of Architect.
      6) Name of City Representative.
      7) Name of Contractor.
      8) Name of firm or entity that prepared submittal.
      9) Names of subcontractor, manufacturer, and supplier.
      10) Category and type of submittal.
      11) Submittal purpose and description.
      12) Specification Section number and title.
      13) Specification paragraph number or drawing designation and generic name for each of multiple items.
      14) Drawing number and detail references, as appropriate.
      15) Indication of full or partial submittal.
      16) Transmittal number, numbered consecutively.
      17) Submittal and transmittal distribution record.
      18) Remarks.
      19) Signature of transmitter.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect and City Representative.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of firm or entity that prepared submittal.
    g. Names of subcontractor, manufacturer, and supplier.
    h. Category and type of submittal.
    i. Submittal purpose and description.
    j. Specification Section number and title.
    k. Specification paragraph number or drawing designation and generic name for each of multiple items.
    l. Drawing number and detail references, as appropriate.
    m. Location(s) where product is to be installed, as appropriate.
    n. Related physical samples submitted directly.
    o. Indication of full or partial submittal.
    p. Transmittal number, numbered consecutively.
    q. Submittal and transmittal distribution record.
    r. Other necessary identification.
    s. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

    a. Project name.
    b. Number and title of appropriate Specification Section.
    c. Manufacturer name.
    d. Product name.

F. Options: Identify options requiring selection by Architect.

G. Deviations: Identify deviations from the Contract Documents on submittals.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's and City Representative’s action stamp.

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

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and City Representative action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. Submit electronic submittals via email as PDF electronic files.

    a. Architect, through City Representative, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect, through City Representative, will return two copies.
3. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect and City Representative will not return copies.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts and finishes.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples. Submit one sample of each product.
6. Submit Product Data in the following format:

a. PDF electronic file.
b. Three paper copies of Product Data unless otherwise indicated. Architect, through City Representative, will return two copies.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:

a. PDF electronic file.
b. Two opaque (bond) copies of each submittal. Architect, through City Representative, will return one copy.
c. Three opaque copies of each submittal. Architect and City Representative will retain two copies; remainder will be returned.

D. Samples: Submit Samples for review of kind, color, pattern, finish, 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.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of applicable Specification Section.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, finish, size, or similar characteristics are required to be selected from manufacturer's product line. Architect, through City Representative, will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit three sets of Samples. Architect and City Representative will retain two Sample sets; remainder will be returned.

        1) If variation in color, pattern, texture, finish, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Submit product schedule in the following format:

    a. PDF electronic file.
    b. Three paper copies of product schedule or list unless otherwise indicated. Architect, through City Representative, will return two copies.

F. Coordination Drawings Submittals:

G. Contractor's Construction Schedule:

H. Application for Payment and Schedule of Values:

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

K. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

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

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

Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

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

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

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

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

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

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

T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

U. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

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

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

X. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

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

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and City Representative.

B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures."

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

3.2 ARCHITECT'S AND CITY REPRESENTATIVE’S ACTION

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

B. Action Submittals: Architect and City Representative will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

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

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

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

END OF SECTION 013300

SECTION 014000

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority, City Representative, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Requirements:

1. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

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

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

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

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

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

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

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

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

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

1.3 CONFLICTING REQUIREMENTS

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

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

1.4 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

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

1.5 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

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

B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

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

1.6 QUALITY ASSURANCE

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

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

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

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

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329 and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

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

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
d. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through City Representative, with one (1) copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or City Representative.
2. Notify Architect and City Representative 7 working days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's and City Representative's approval of mockups before starting work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections in Divisions 02 through 33.

1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.

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

E. Testing Agency Responsibilities: Cooperate with Architect, City Representative, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, City Representative, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Does not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

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

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

1.8 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction and as follows:

B. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, City Representative, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, through City Representative, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, and City Representative's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

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

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

END OF SECTION 014000

SECTION 014200

REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

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

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

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

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

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

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

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

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

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

1.2 INDUSTRY STANDARDS

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

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

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

AA	Aluminum Association (The)
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
ABAA	Air Barrier Association of America
ABMA	American Bearing Manufacturers Association
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies, Inc. (The)
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AHAM	Association of Home Appliance Manufacturers
AHRI	Air-Conditioning, Heating, andRefrigeration Institute, The
AI	Asphalt Institute
AIA	American Institute of Architects (The)
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute

AITC	American Institute of Timber Construction
ALSC	American Lumber Standard Committee, Incorporated
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
AOSA	Association of Official Seed Analysts, Inc.
APA	APA - The Engineered Wood Association
APA	Architectural Precast Association
API	American Petroleum Institute
ARI	Air-Conditioning & Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASCE	American Society of Civil Engineers
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	ASME International (American Society of Mechanical Engineers International)
ASSE	American Society of Sanitary Engineering
ASTM	ASTM International (American Society for Testing and Materials International)
ATIS	Alliance for Telecommunications Industry Solutions
AWCMA	American Window Covering Manufacturers Association (Now WCMA)
AWCI	Association of the Wall and Ceiling Industry
AWI	Architectural Woodwork Institute
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association)
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)

BICSI	BICSI, Inc.
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International)
BISSC	Baking Industry Sanitation Standards Committee
CCC	Carpet Cushion Council
CDA	Copper Development Association
CEA	Canadian Electricity Association
CEA	Consumer Electronics Association
CFFA	Chemical Fabrics & Film Association, Inc.
CGA	Compressed Gas Association
CIMA	Cellulose Insulation Manufacturers Association
CISCA	Ceilings & Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CPA	Composite Panel Association
CRI	Carpet and Rug Institute (The)
CRRC	Cool Roof Rating Council
CRSI	Concrete Reinforcing Steel Institute
CRRC	Cool Roof Rating Council
CSA	Canadian Standards Association
CSA	CSA International (Formerly: IAS - International Approval Services)
CSI	Construction Specifications Institute (The)
CSSB	Cedar Shake & Shingle Bureau
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute)
DHI	Door and Hardware Institute
ECA	Electrical Components Association
EIA	Electronic Industries Alliance

EIMA	EIFS Industry Members Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ESD	ESD Association (Electrostatic Discharge Association)
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA)
FIBA	Federation Internationale de Basketball (The International Basketball Federation)
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation)
FM Approvals	FM Approvals LLC
FM Global	FM Global (Formerly: FMG - FM Global)
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.
FSA	Fluid Sealing Association
FSC	Forest Stewardship Council
GA	Gypsum Association
GANA	Glass Association of North America
GRI	(Part of GSI)
GS	Green Seal
GSI	Geosynthetic Institute
HI	Hydronics Institute
HI/GAMA	Hydronics Institute/Gas Appliance Manufacturers Association Division of Air-Conditioning, Heating, and Refrigeration Institute (AHRI)
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)
HPVA	Hardwood Plywood & Veneer Association
HPW	H. P. White Laboratory, Inc.
IAPSC	International Association of Professional Security Consultants
ICBO	International Conference of Building Officials

ICEA	Insulated Cable Engineers Association, Inc.
ICRI	International Concrete Repair Institute, Inc.
ICPA	International Cast Polymer Association
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
IES	Illuminating Engineering Society of North America
IEST	Institute of Environmental Sciences and Technology
IGMA	Insulating Glass Manufacturers Alliance
ILI	Indiana Limestone Institute of America, Inc.
ISA	Instrumentation, Systems, and Automation Society, The
ISO	International Organization for Standardization
ISSFA	International Solid Surface Fabricators Association
ITS	Intertek Testing Service NA (Now ETL SEMCO)
ITU	International Telecommunication Union
KCMA	Kitchen Cabinet Manufacturers Association
LGSEA	Light Gauge Steel Engineers Association
LMA	Laminating Materials Association (Now part of CPA)
LPI	Lightning Protection Institute
MBMA	Metal Building Manufacturers Association
MCA	Metal Construction Association
MFMA	Maple Flooring Manufacturers Association, Inc.
MFMA	Metal Framing Manufacturers Association, Inc.
MH	Material Handling (Now MHIA)
MHIA	Material Handling Industry of America
MIA	Marble Institute of America
MPI	Master Painters Institute

MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NACE	NACE International (National Association of Corrosion Engineers International)
NADCA	National Air Duct Cleaners Association
NAGWS	National Association for Girls and Women in Sport
NAIMA	North American Insulation Manufacturers Association
NBGQA	National Building Granite Quarries Association, Inc.
NCAA	National Collegiate Athletic Association (The)
NCMA	National Concrete Masonry Association
NCTA	National Cable & Telecommunications Association
NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association
NeLMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFHS	National Federation of State High School Associations
NFPA	NFPA (National Fire Protection Association)
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NLGA	National Lumber Grades Authority
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)
NOMMA	National Ornamental & Miscellaneous Metals Association
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	NSF International (National Sanitation Foundation International)

NSSGA	National Stone, Sand & Gravel Association
NTMA	National Terrazzo & Mosaic Association, Inc. (The)
NWFA	National Wood Flooring Association
PCI	Precast/Prestressed Concrete Institute
PDI	Plumbing & Drainage Institute
PGI	PVC Geomembrane Institute
PTI	Post-Tensioning Institute
RCSC	Research Council on Structural Connections
RFCI	Resilient Floor Covering Institute
RIS	Redwood Inspection Service
SAE	SAE International
SCAQMD	South Coast Air Quality Management District
SCTE	Society of Cable Telecommunications Engineers
SDI	Steel Deck Institute
SDI	Steel Door Institute
SEFA	Scientific Equipment and Furniture Association
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)
SIA	Security Industry Association
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SMPTE	Society of Motion Picture and Television Engineers
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)
SPIB	Southern Pine Inspection Bureau (The)
SPRI	Single Ply Roofing Industry

SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings
STI	Steel Tank Institute
SWI	Steel Window Institute
SWPA	Submersible Wastewater Pump Association
TCA	Tilt-Up Concrete Association
TCNA	Tile Council of North America, Inc.
TEMA	Tubular Exchanger Manufacturers Association
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TMS	The Masonry Society
TPI	Truss Plate Institute, Inc.
TPI	Turfgrass Producers International
TRI	Tile Roofing Institute
UL	Underwriters Laboratories Inc.
UNI	Uni-Bell PVC Pipe Association
USAV	USA Volleyball
USGBC	U.S. Green Building Council
USITT	United States Institute for Theatre Technology, Inc.
WASTEC	Waste Equipment Technology Association
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association)
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California)
WMMPA	Wood Moulding & Millwork Producers Association
WSRCA	Western States Roofing Contractors Association
WWPA	Western Wood Products Association

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

DIN	Deutsches Institut fur Normung e.V.
IAPMO	International Association of Plumbing and Mechanical Officials
ICC	International Code Council
ICC-ES	ICC Evaluation Service, Inc.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

COE	Army Corps of Engineers
CPSC	Consumer Product Safety Commission
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FDA	Food and Drug Administration
GSA	General Services Administration
HUD	Department of Housing and Urban Development
LBL	Lawrence Berkeley National Laboratory
NCHRP	National Cooperative Highway Research Program (See TRB)
NIST	National Institute of Standards and Technology
OSHA	Occupational Safety & Health Administration
PBS	Public Buildings Service (See GSA)
PHS	Office of Public Health and Science
RUS	Rural Utilities Service (See USDA)

SD	State Department
TRB	Transportation Research Board
USDA	Department of Agriculture
USP	U.S. Pharmacopeia
USPS	Postal Service

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board
CFR	Code of Federal Regulations Available from Government Printing Office
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point
DSCC	Defense Supply Center Columbus (See FS)
FED-STD	Federal Standard (See FS)
FS	Federal Specification Available from Department of Defense Single Stock Point Available from Defense Standardization Program Available from General Services Administration Available from National Institute of Building Sciences
FTMS	Federal Test Method Standard (See FS)
MIL	(See MILSPEC)
MIL-STD	(See MILSPEC)
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point
UFAS	Uniform Federal Accessibility Standards Available from Access Board

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

CBHF State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation

CCR California Code of Regulations

CDHS California Department of Health Services

CDPH California Department of Public Health, Indoor Air Quality Section

CPUC California Public Utilities Commission

TFS Texas Forest Service
Forest Resource Development

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015639

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. General: Section includes Temporary Tree and Plant Protection of existing trees and plants that are affected by the execution of the Work in accordance with Contract Documents.

B. Summary of Work: Provide all labor, equipment and materials required for the procurement, delivery and operations for temporary tree and plant protection as indicated on Drawings and as specified herein.

1. Section Includes:

a. Examination and preparation.
b. Protection of trees and plants.
c. Excavation.
d. Root pruning.
e. Crown pruning.
f. Re-grading.
g. Repair and replacement.

C. Related Sections:

1. Division 01 for Special Project Procedures.

2. Specification Section 329100 – Soil Preparation.

3. Specification Section 328400 – Irrigation.

4. Specification Section 329300 – Planting.

5. Specification Section 329600 – Transplanting.

1.2 DEFINITIONS

A. Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated on Drawings.

1.3 SUBMITTALS

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

B. Samples: For each type of organic mulch in sealed plastic bags labeled with composition of materials by percentage of weight, protection zone fencing and protection zone signage.

C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

D. Certification: From California Certified Arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

E. Maintenance Recommendations: From California Certified Arborist, for care and protection of trees affected by construction during and after completing the Work.

F. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes pre-construction conditions that might be misconstrued as damage caused by construction activities.

1.4 QUALITY ASSURANCE

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

B. Follow the City of Beverly Hills Protecting City Parkway Street Trees during Private Property Construction specifications.

1.5 PROJECT CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.

2. Parking vehicles or equipment.

3. Foot traffic.

4. Erection of sheds or structures.

5. Impoundment of water.

6. Excavation or digging unless otherwise indicated on Drawings.

7. Attachment of signs to trees or plants unless otherwise indicated on Drawings.

8. Wrapping materials around trees or plants unless otherwise indicated on Drawings.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: Natural or cultivated top layer of the soil profile or manufactured topsoil; containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; free of subsoil, clay lumps, gravel, and other objects more than 1 inch (25 mm) in diameter; and free of weeds, roots, and toxic and other non-soil materials.

B. Topsoil: Stockpiled topsoil from location indicated on Drawings.

C. Organic Mulch: Ground or shredded bark free from deleterious materials.

D. Protection Zone Fencing: Fencing fixed in position and meeting one of the following requirements. Previously used materials may be used when approved by Landscape Architect.

1. Chain Link Protection Zone Fencing: Galvanized steel fencing fabricated from minimum 2-inch (50-mm) opening, 0.148-inch (3.76-mm) diameter wire chain link fabric; with pipe posts, minimum 2-3/8-inch- (60-mm) outside dimension line posts, and 2-7/8-inch- (73-mm-) outside dimension corner and pull posts; with 1-5/8-inch (42-mm) outside dimension top rails and 0.177-inch (4.5-mm) diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.

2. Height of Fencing: 5 feet.

3. Gates: Swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones.

E. Protection Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes pre-punched and reinforced; legibly printed with non-fading lettering, no less than 8.5 x 11 inches.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Protection Zones: Mulch areas inside protection zones and other areas indicated with 3-inch average thickness of organic mulch. Do not place mulch within 6 inches (150 mm) of tree trunks.

3.2 PROTECTION ZONES

A. Protection Zone Fencing: Install protection zone fencing along edges of protection zones in a manner that will prevent people from easily entering protected area except by entrance gates.

1. Chain Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.

2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Landscape Architect.

B. Protection Zone Signage: Install protection zone signage in visibly prominent locations in a manner approved by Landscape Architect.

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

D. Maintain protection zone fencing and signage in good condition as acceptable to Landscape Architect and remove when construction operations are complete and equipment has been removed from the site.

3.3 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Specification Section 312000 – Earth Moving.

B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities.

C. Do not allow exposed roots to dry out before placing permanent backfill.

3.4 ROOT PRUNING

A. Prune roots that are affected by temporary and permanent construction only after review with project landscape architect.

1. Perform root pruning under direction of California Certified Arborist.

2. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.

3. Temporarily support and protect roots from damage until they are permanently covered with soil.

4. Cover exposed roots with burlap and water regularly.

5. Backfill as soon as possible according to requirements in Specification Section 312000 – Earthwork.

B. Root Pruning at Edge of Protection Zone: Prune roots by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand to the depth of the required excavation 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.

3.5 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction only after review with project landscape architect

1. Perform crown pruning under direction of California Certified Arborist.

2. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by California Certified Arborist.

3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).

4. Cut branches with sharp pruning instruments; do not break or chop.

5. Do not apply pruning paint to wounds.

B. Chip removed branches and spread over areas identified by Landscape Architect, or stockpile in areas approved by City Representative.

3.6 RE-GRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

C. Minor Fill within Protection Zone: Where existing grade is 2 inches (50 mm) or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.7 FIELD QUALITY CONTROL

A. Inspections: Engage a California Certified Arborist to direct plant protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.8 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Landscape Architect.

1. Have California Certified Arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.

2. Treat damaged trunks, limbs, and roots according to California Certified Arborist's written instructions.

3. Perform repairs within 24 hours.

4. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 015639

SECTION 016000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Requirements:

1. Division 01 Section "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor through City Representative of approval or rejection of

proposed comparable product request within 15 working days of receipt of request, or 7 working days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

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

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

B. Delivery and Handling:

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

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project improvements or structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on

product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to Divisions 02 through 33. Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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

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

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:

    a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with

requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:

a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

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

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017700

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
2. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
3. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

D. Record Drawings.

E. Maintenance Manual.

F. Survey.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 working days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by City Representative. Label with manufacturer's name and model number where applicable.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain City Representative’s signature for receipt of submittals.

5. Submit test/adjust/balance records.
6. Submit sustainable design submittals required in Division 01 sustainable design requirements Section and in individual Division 02 through 33 Sections.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 working days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Advise Owner of changeover in heat and other utilities.
6. Participate with Owner in conducting inspection and walkthrough with local emergency responders.

7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
8. Complete final cleaning requirements, including touchup painting.
9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and City Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings.

B. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

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

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order.

2. Organize items applying to each space by major element, including categories for paving, walls, equipment, irrigation systems, planting, etc.
3. Submit list of incomplete items in the following format:

    a. MS Excel electronic file. Architect through City Representative will return annotated copy.
    b. PDF electronic file. Architect through City Representative will return annotated copy.
    c. Three paper copies unless otherwise indicated. Architect through City Representative, will return two copies.

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

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

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

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

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

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
h. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
i. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
j. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Division 01 Section "Temporary Facilities and Controls." Prepare written report.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

    a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

SECTION 017823

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Requirements:

1. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect through City Representative will return two copies.

C. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 calendar days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.

1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.

B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

C. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for City Representative.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major sub-consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each

system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes. Number of copies per City Representative requirements.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

   a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Water leak.
4. Power failure.
5. Water outage.
6. System, subsystem, or equipment failure.
7. Chemical release or spill.

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

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

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

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

2.4 PRODUCT MAINTENANCE MANUALS

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

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

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine maintenance.
5. Repair instructions.

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

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

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

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

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

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

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

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

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

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

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Requirements:

1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
2. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up record prints.
2. Number of Copies: Submit copies of record Drawings as follows:

a. Initial Submittal:

1) Submit one paper-copy set of marked-up record prints.
2) Submit PDF electronic files of scanned record prints and one set of file prints.
3) Submit record digital data files and one set of plots.
4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit three paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned record prints and three set(s) of prints.
3) Print each drawing, whether or not changes and additional information were recorded.

c. Final Submittal:

1) Submit one paper-copy set of marked-up record prints.

2) Submit record digital data files and three set(s) of record digital data file plots.
3) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy and annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy and annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Record data as soon as possible after obtaining it.
c. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and City Representative. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Format: DWG Version 2014 for Microsoft Windows operating system.
3. Format: Annotated PDF electronic file.
4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
5. Refer instances of uncertainty to Architect through City Representative for resolution.
6. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect and City Representative.
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

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

B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

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

END OF SECTION 017839

SECTION 02 41 13

SELECTIVE SITE DEMOLITION

PART 1 GENERAL

1.1 DESCRIPTION

A. Provide all wrecking and demolition, including the removal and disposal of items, as shown on the drawings and as specified, complete.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Traffic.

a. Obstruction. Do not close, obstruct, or store material or equipment in street, sidewalks, alleys or passageways on campus in accordance with the requirements of the codes listed in division 1.

1.3 JOB CONDITIONS

A. Environmental Requirements:

1. Wrecking and Demolition. Accomplish wrecking and demolition in a manner that provides for the safety of the public and all workmen and provides for the protection of all property not to be wrecked or demolished. Methods shall be subject to approval of Project Manager.

2. Surface Water. After the existing landscape has been removed, protect the resulting excavation or open area from surface water. Promptly remove any water which accumulates in the excavation or opening. The method of dewatering and the disposal of the water is subject to approval by Project Manager.

a. Prevent surface water from running into the excavated areas. Water which accumulates in the excavation shall be removed promptly. Provide and maintain all necessary bailing, draining, pumping and sheathing.

b. Contractor shall be responsible for all additional Work required if ingress of ground or surface water softens excavated areas.

PART 2 PRODUCTS: Not Used

PART 3 EXECUTION

3.1 INSPECTION

A. Condition of Premises: Accept the premises as found and clear the Project site as specified.

3.2 PREPARATION

A. Utilities: Prior to disconnecting, removing, plugging or abandoning existing utilities serving the buildings being removed, obtain owner's approval. A minimum 48-hour advance notification is required for all utility shutdowns.

3.3 PERFORMANCE

A. Performance:

1. Wrecking and Demolition. Dismantle and remove all items and obstructions as shown on the Drawings or called out in these Specifications. Remove all foundations completely. Remove all pavement, curbs and sidewalks and other concrete slabs as required to execute the work. Do not damage adjacent remaining pavement or sidewalks. Make cut in such a manner that a clean vertical joint remains. Turn over all light poles and fixtures removed as part of the project to the Owner.

2. The ends of abandoned utilities shall be capped or plugged as approved.

3. Removal. Unless otherwise specified, all materials removed shall become the property of Contractor and shall be removed completely away from the Project site for disposal at a legal dumping site. Secure and pay for required hauling permits and pay dumping fees and charges.

4. Salvaged Items. Unless otherwise specified, salvaged items shall be returned to the Owner in a condition accepted by the owner. Items to be salvaged by the contractor shall be coordinated with the Owner prior to demolition and/or construction.

5. A 48 hour notice shall be provided to the Owner for any utility shut downs.

3.4 FIELD QUALITY CONTROL

A. Workmanship:

1. Demolition Work. Execute in an orderly manner with due consideration for adjacencies and the public. Execute the Work to insure adjacent properties and the public against damages incurred by falling debris or other causes.

2. Burning of Materials. Burn no materials or debris on the premises.

3. Dust Control. Sprinkle all rubbish and debris to keep down the dust.

B. Traffic:

1. Interference. Conduct operations with minimum interference with roads, streets, driveways, alleys, sidewalks and other facilities. Flagmen shall be used as necessary for traffic control. Maintain safe access to public at all time.

3.5 ADJUSTMENT AND CLEANING

A. Repairs and Replacements: Clean up, repair, or replace at no cost to Owner all property damaged by reason of required Work, including restoring all disturbed areas, surfaced and unsurfaced, to their original condition on completion of the Work as approved. All patchwork shall match existing. Painted surfaces shall be painted to match the adjacent areas.

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
   1. Section includes:
      a. Wall.
      b. Concrete bands/curbs.
      c. Footings.
      d. Concrete pads

1.2 ACTION SUBMITTALS

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

B. Design Mixtures: For each concrete mixture.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, form ties and support of formwork.

   1. Includes items to be board formed finished.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Material certificates.

C. Material test reports.

D. Concrete design mixes.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

C. Preinstallation Conference: Conduct conference at Project site prior to beginning concrete forming operations.

D. Mock Ups: Construct full size mock ups of all proposed concrete items, minimum 5 feet x 5 feet, or minimum 10 feet length, full height. If accepted work can remain in project if approved by Landscape Architect.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. As drawn and specified by the Structural Engineer.

2.2 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type V, gray. Supplement with the following:

a. Fly Ash: ASTM C 618, Class F or C.

B. Normal-Weight Aggregates: ASTM C 33, graded.

1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.3 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Integral color: not applicable.

C. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Top surface Retarder: 'Top Cast' as manufactured by Grace, Inc. 877-423-6491.

E. Water: Potable.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: High density foam.

2.6 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 20 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

D. Proportion normal-weight concrete mixture as follows; curb, integral curb and pavement, gutter, walk, and alley aprons.

1. Minimum Compressive Strength: 2500 psi (20.7 MPa) at 28 days.
2. Slump Limit: 4 inches (100 mm).
3. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.

E. Proportion normal-weight concrete mixture as follows; retaining walls.

1. Minimum Compressive Strength: 3250 psi (20.7 MPa) at 28 days.
2. Slump Limit: 4 inches (100 mm).
3. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.

2.7 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to Structural drawings and specifications and CRSI's "Manual of Standard Practice."

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M[ ], and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 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.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Do not chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" and according to Structural drawings and specifications for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.4 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Landscape Architect.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-third of concrete thickness as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, and other locations, as indicated on drawings.

3.5 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 301.

3.6 FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply face mix grind finish to concrete surfaces exposed to public view**:**
   a. Mow band/curb

2. Apply light sand blast finish to retaining wall.

3.7 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
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 (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. 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 written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when identified as not conforming to the specified finish by Architect. Remove the rejected concrete between joints as to not provide a patch or repair to an area smaller than a full panel. Replace concrete that cannot be repaired and patched to Architect's approval.

3.9 FIELD QUALITY CONTROL

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

END OF SECTION 033000

SECTION 129300

SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Work in this section includes providing the equipment, labor and expertise to procure, deliver and install the site furnishings specified and shown on the drawings.

1.2 RELATED SECTIONS

A. Division 32 Section “Site Concrete Work”.

B. Division 32 Section “Crushed Stone Paving” (Decomposed Granite)

C. Division 32 Section “Planting”

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of site furnishings through one source from a single manufacturer.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include cut sheet with each material description, dimensions of individual components and profiles, colors, finishes, field-assembly requirements, and installation details.

B. Shop Drawings: Provide Shop Drawings depicting the proposed material, fabrication, assembly, color, finish, installation method and maintenance of each type of product indicated

C. Timing: Submit Site Furnishing Product Data simultaneously and complete to facilitate coordination of finishes and colors.

1.5 EXTRA MATERIALS

A. Furnish extra materials described below before installation begins. Match products installed for size, color and finish. Package with protective covering for Owner storage and label to identify part and quantity.

1. Provide (4) cans of touch up spray paint or stain for each color.
2. Provide (1) gallon of sealer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

B. Products: Subject to compliance with requirements as shown on the drawings.

C. Trash receptacle: model number: 157-22-25BT 22Gallon manufacturer: Dumor Inc., finish: steel coated with zinc epoxy, polymer powder coated. color: black.

D. Dog Amenity Receptacle: manufacture: Mutt Mitt Inc., finish: powder coat color: green.

2.2 MATERIALS

A. Anchors, Fasteners, Fittings, and Hardware: Provide commercial quality, corrosion-resistant-coated, or non corrodible materials as recommended by manufacturer. Provide as required for site furnishings' assembly, mounting, and secure attachment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated. Complete field assembly of site furnishings, where required.

B. Unless otherwise indicated, install site furnishings after supportive paving has been completed.

C. Trash Receptacles: Install trash receptacles level, plumb, true, and securely anchored as necessary at locations indicated on Drawings.

D. Verify that all proposed items are set plumb and are aligned and at correct height. Secure items in position during placement and finishing operations until concrete is sufficiently cured or grades are adjusted for appropriate installation. Top of footings are to be held below finish surface of concrete paving or gravel paving as indicated on Drawings. Top of footing shall not be visible at finish grade. Protect portion of items above footing from concrete splatter.

E. Contractor to conduct pre installation site meeting with landscape architect and Owners representative prior to installation operations commence for each Site furnishing items as shown on the drawings.

3.3 CLEANING

A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION 129300

SECTION 260126

ELECTRICAL ACCEPTANCE TESTING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Acceptance testing requirements for electrical power systems.

1.2 APPLICABLE PUBLICATIONS: THE FOLLOWING PUBLICATIONS FORM A PART OF THIS SPECIFICATION TO THE EXTENT REFERENCED. THE PUBLICATIONS ARE REFERRED TO IN THE TEXT BY THE BASIC DESIGNATION ONLY.

A. American National Standards Institute, Inc. (ANSI) Publication:
   1. C2-2002 National Electrical Safety Code
   2. C37.16-88 Low-Voltage Power Circuit Breakers and AC Power Circuit Protectors - Preferred Ratings, Related Requirements and Application Recommendations

B. International Electrical Testing Association Inc. (NETA) Publication:
   1. Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems

C. Institute of Electrical and Electronic Engineers (IEEE) Publications:
   1. 141-86 Recommended Practice for Electric Power Distribution for Industrial Plants
   2. 242-86 Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
   3. 399-90 Recommended Practice for Industrial and Commercial Power System Analysis
   4. 446-87 Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications

D. National Fire Protection Association (NFPA) Publication:
   1. 70-National Electrical Code (NEC), California Adopted Edition

1.3 SUBMITTALS

A. Submit six (6) copies under provisions of Section 26 05 00.

B. Qualifications: Provide for:
   1. Independent testing organization.
   2. Certified Engineering Technician(s) to be assigned to the project.

C. Acceptance Test Procedures: Provide for:
   1. Main service switchboard and Power Panelboards
   2. Grounding systems
   3. Low voltage transformers

D. Certified Test Reports: The final report shall be signed and shall include the following information: Summary of the project, description of the equipment tested, visual inspection report, description of the tests, test results, conclusions and recommendations, appendix

including appropriate test forms, and identification of the test equipment used. Provide bound copies for:

1. Main service switchboard and Power Panelboards
2. Grounding systems
3. Low voltage transformers

1.4 QUALIFICATIONS

A. The Contractor shall engage the services of a qualified independent testing organization to provide final inspection, testing, calibration, and adjusting on the electrical distribution system as defined in this Section. The independent testing organization shall have been engaged in full practice for a minimum of five years. The organization shall be corporately independent of the supplier, producer, manufacturer or installer of the equipment.

B. The independent testing organization shall have a calibration program with accuracy traceable every six months, and in an unbroken chain, to the National Institute of Standards and Technology (N.I.S.T.).

C. The independent testing organization shall have a designated safety representative on the project. The safety standards shall include OSHA and NFPA 70E.

D. Testing and inspection shall be performed by an Engineering Technician, certified by a national organization, with a minimum 5 years experience inspecting, testing and calibrating electrical distribution equipment, systems and devices. Information on the qualifications of the Certified Engineering Technician shall be submitted to the Engineer for approval prior to the start of work.

E. The qualifications of the independent testing organization shall be submitted to the Engineer for approval minimum 30 days prior to the start of testing.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 ALL INSPECTIONS SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE CODES AND STANDARDS INCLUDING NEC, ANSI, IEEE, NEMA AND OSHA.

A. The independent testing organization shall provide all materials, equipment, labor and technical supervision to perform the inspections and tests.

3.2 INSPECTION

A. A visual inspection of the installed equipment shall be performed by the independent testing organization to verify that the distribution equipment installed and to be tested is the equipment denoted on the approved shop drawings. The inspection shall check the equipment designations, device characteristics, special installation requirements, applicable codes and standards.

B. After completion of the visual inspection, a report shall be developed stating any discrepancies that may have been found.

3.3 TESTING, CALIBRATION AND ADJUSTMENT

A. The independent testing organization shall perform tests on each item of distribution equipment identified in accordance with the latest edition of the International Electrical Testing Association's (NETA) Acceptance Testing Specification for Electrical Power Distribution Equipment and Systems.

B. Field acceptance testing shall be accomplished on each item of electrical distribution equipment installed or connected as part of this contract. This shall include:
1. Main service switchboard and Power Panelboards
2. Low voltage circuit breakers (>100A)
3. Grounding systems

C. Systems shall be energized or otherwise placed in service only after completion of all required tests and an evaluation of the test results has been completed.

3.4 CORRECTION OF DEFICIENCIES

A. Any deficiencies found shall be rectified, and work affected by such deficiencies shall be completely re-tested at the Contractor's expense. Final acceptance of the electrical power system is contingent upon satisfactory completion of the acceptance and system function tests.

END OF SECTION 260126

SECTION 260500

ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE:

A. Electrical General Requirements specifically applicable to Division 26 Sections, in addition to Division 1 - General Requirements. Work includes but is not necessarily limited to the following:

B. Definitions, guarantees, submittals, clean-up, "As-Builts" and all other applicable requirements of and Division 1 apply to the work of this section.

C. Examine all other sections for work related to those sections which are required to be included as work under this section.

D. Coordinate all work in this Division with related trades.

E. The work includes but is not limited to the following:
1. Provide new weather and vandal resistant power distribution panel
2. Provide circuiting to site lighting
3. Provide lighting time-clock controller
4. Incidental items not indicated in the Specifications that belong to the work described, or are required to provide complete and operable systems, as though called out here in every detail.

F. Excavation, shoring, backfill and concrete work required to complete items of this section.

G. Cleaning, cutting patching, repairing land and hardscapes.

1.2 APPLICABLE PUBLICATIONS:

The following publications form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American National Standards Institute, Inc. (ANSI) Publications:
1. C2-2002 National Electrical Safety Code
2. C37.20-81 Switchgear Assemblies, including supp. C37.20A, C37.20B, Interfiled; C37.20D-78

B. State of California Administrative Codes:
1. Title 8, Industrial Relations
2. Title 24, Part 2, California Energy Code, California Adopted Edition
3. Title 24, Part 3, CCR, California Electrical Code, California Adopted Edition

C. National Electrical Manufacturers Association (NEMA) Publication:

1. ICS6-83 (R86) Enclosures for Industrial Controls and Systems

D. National Fire Protection Association (NFPA) Publications:
1. 70-National Electrical Code (NEC), California Adopted Edition
2. 70B-Electrical Equipment Maintenance, California Adopted Edition

E. State of California Public Utilities Commission (Cal. P.U.C.) Publication:
1. G.O. 128 Rules for Construction of Underground Electrical Supply and Communications Systems

1.3 WORK SEQUENCE

A. Install work in phases to accommodate specified occupancy requirements. During the construction period, coordinate and update electrical outage schedule and operations with the Construction Administrator on a weekly basis.

1.4 DEFINITIONS:

The following definitions apply to terms used in the narrative and in the specifications.

A. The words "work" or "electrical work" herein include products, labor, equipment, tools, appliances, transportation and all related items, directly or indirectly required to complete the specified and indicated electrical installation.

B. The word "concealed" shall mean that the installation will not be visible when all permanent or removable elements of the construction are in place. The word "exposed" shall mean that the installation is visible when all permanent or removable elements of the construction are in place.

C. The word "code" shall mean any and all regulations and requirements of regulatory bodies, public and private, having jurisdiction over the work involved.

D. The word "product" used in Division 26 means all material, equipment, machinery, and/or appliances directly or indirectly required to complete the specified and/or indicated electrical work.

E. The words "standard product" shall mean a manufactured product, illustrated and/or described in catalogs or brochures, which are in general distribution prior to the date of issue of construction documents for bidding. Products will generally be identified by means of a specific catalog number and manufacturer's name.

F. The word "provide" shall mean furnish and install and where applicable shall also mean connect, complete installation and test.

G. The word "remove" shall mean remove and dispose of equipment or material off-site.

H. The words "powered equipment", as used in Division 26, shall mean a complex product converting an electrical energy source to Mechanical power.

I. In each standard referenced to in the technical sections, consider the advisory provisions to be mandatory, and as though the word "shall" have been substituted for "should" wherever it appears. Interpret references in these standards to "authority having jurisdiction," or other words of similar meaning, to mean Owner.

J. The word "Authorized" or "Authorization" shall mean authorized or authorization by the Construction Administrator.

K. Refer to Division 1, General Requirements, for additional definitions of words and phrases used to describe Division 26, Electrical Work.

1.5 DISCREPANCIES

A. Where a conflict in requirements occurs between the specifications and narrative and a resolution is not obtained from the Construction Administrator before the bidding date, the more expensive alternate will become the contractual requirement.

B. Omissions from the narrative or specifications or the misdescription of details of work which are manifestly necessary to carry out the intent of the narrative and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work but they shall be performed as if fully and correctly set forth and described in the narrative and specifications.

C. The Contractor shall check narrative furnished him immediately upon their receipt and shall promptly notify the Construction Administrator of any discrepancies.

1.6 CHANGES:

A. The Contractor shall be responsible to make and obtain approval for all necessary adjustments in conduit and equipment layouts as required to accommodate the relocations of equipment and/or devices which are affected by any approved authorized changes or Product substitutions. All changes shall be clearly indicated on the "Record" drawings.

1.7 COOPERATION WITH WORK UNDER OTHER DIVISIONS

A. The arrangement of and connection to equipment shall be shown on design drawings.

B. Cooperate with other trades to facilitate general progress of Work. Allow all other trades every reasonable opportunity for installation of their work.

C. Work under this Division shall follow general building construction closely. Set conduit sleeves and inserts and verify that openings for chases and conduits are provided before concrete is placed or masonry installed.

D. Work with other trades in determining exact location of outlets, conduit, lighting fixtures, and pieces of equipment to avoid interference with lines required to maintain proper installation of work.

E. Make such progress in the work to not delay work of other trades.

1.8 SUBMITTALS:

A. Submit electronic (PDF format) sets of shop drawings, manufacturer's data certificates for equipment, materials and finish, and pertinent details for each system where specified in each individual section, and obtain approval before procurement, fabrication, or delivery of the items to the job site. Partial submittals are not acceptable and will be returned without review. Include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable technical society publication references, and other information necessary to establish contract compliance of each item the Contractor proposes to furnish. Photographs of existing installations and data submitted in lieu of catalog data are not acceptable and will be returned without approval. Contractor shall be responsible for reviewing and certifying submittals as conforming to the narrative and specifications prior to submittal and shall verify conformance of equipment as delivered with final shop submittals, specifications and plans. Contractor shall report to Construction Administrator any deviations prior to initiation of construction. Contractor is responsible for promptly reporting to Construction Administrator any news of late equipment delivery which is likely or certain to delay installation.

B. Submit shop drawings and product data grouped and referenced by the technical Section numbers.

C. Proposed Products List: Include Products as required by the individual section in this Division.

D. The Contractor shall be responsible for all equipment ordered and/or installed prior to receipt of shop drawings returned from the Construction Administrator bearing the stamp of "reviewed". All corrections or modifications to the equipment as noted on the shop drawings shall be performed and equipment removed from the job site when required by the Construction Administrator, without additional compensation.

E. Shop Drawings: Drawings shall be a minimum of 8.5 inches by 11 inches in size with a minimum scale of 1/8-inch per foot, except as specified otherwise. Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, duct work, and other items that must be shown to assure a coordinated installation. In wiring diagrams, identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. If equipment is disapproved, revise drawings to show acceptable equipment and resubmit.

F. Manufacturer's Data: For each manufactured item, provide current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves if applicable, and catalog cuts.

G. Standard Compliance: When materials or equipment provided by the Contractor must conform to the standards of organizations such as American National Standards Institute (ANSI) or Underwriters' Laboratories (UL), submit proof of such conformance to the Construction Administrator for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified. In lieu of the label or listing, submit a certificate from an independent testing organization, which is competent to perform acceptance testing and is approved by the Construction Administrator. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard.

H. Certified Test Reports: Before delivery of materials and equipment, certified copies of all test reports specified in individual sections shall be submitted for approval.

I. Certificates of Compliance or Conformance: Submit manufacturer's certifications as required on products, materials, finish, and equipment indicated in the technical sections. Certifications shall be documents prepared specifically for this contract. Pre-printed certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; or "achieve the same end use and results as materials formulated in accordance with the referenced publications"; or "equal or exceed the service and performance of the specified material." Certifications shall simply state that the item conforms to the requirements specified. Manufacturer shall use Form 26 05 00-A for equipment installation certification. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance or conformance.

1.9 REGULATORY REQUIREMENTS

A. Electrical: Conform to NFPA 70, CA PUC G.O. 95, CA PUC G.O. 128, ANSI C2, CAC Title 24, NFPA 101 and all other utility company requirements, state and local codes.

B. The electrical requirements shall be the minimum acceptable requirements for the work and nothing described in these Specifications or Narrative shall be construed to permit work not conforming to the most stringent of the applicable codes and regulations. When narrative or specifications call for materials or construction of better quality of larger size than required by codes, laws, rules and regulations, the specifications and narrative shall take precedence.

C. Equipment not complying with applicable codes shall be removed and replaced with approved equipment at Contractor's expense. UL listing labels, where applicable, shall be installed prior to shipment from factory.

D. Obtain permits, and request inspections from authority having jurisdiction.

1.10 GUARANTEE

A. Except as may be specified under other sections in the Specifications, guarantee all equipment furnished under the Specifications for a period of one year from date of project acceptance against defective workmanship and material and improper installation. Upon notification of failure, correct deficiency immediately and without cost to the Owner.

B. Standard warranty of manufacturer shall apply for replacement of parts after expiration of the above period. Manufacturer shall furnish replacement parts to the Owner for their service agency as directed. Furnish manufacturer's warranties for all equipment furnished under this project.

1.11 PROJECT/SITE CONDITIONS

A. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other Sections. Obtain approval of design drawings before proceeding with the work.

1.12 OPERATION AND MAINTENANCE MANUAL:

A. Provide operation and maintenance manual of all equipment and lighting fixtures furnished on this project.

1.13 POSTED OPERATING INSTRUCTIONS:

A. Furnish approved operating instructions for systems and equipment indicated in the technical sections for use by operation and maintenance personnel. The operating instructions shall include wiring diagrams, control diagrams, and control sequence for each principal system and equipment. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions as directed. Attach or post operating instructions adjacent to each principal system and equipment including startup, proper adjustment, operating, lubrication, shutdown, safety precautions, procedure in the event of equipment failure, and other items of instruction as recommended by the manufacturer of each system or equipment. Provide weather-resistant materials or weatherproof enclosures for operating instructions exposed to the weather. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.14 MANUFACTURER'S RECOMMENDATIONS:

A. Where installation procedures or any part thereof are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendations shall be cause for rejection of the equipment or material.

1.15 DELIVERY AND STORAGE:

A. Handle, store, and protect equipment and materials in accordance with the manufacturer's recommendations and with the requirements of NFPA 70B P, Appendix I, titled "Equipment Storage and Maintenance during Construction." Replace damaged or defective items with new items. Refer to Contract General Conditions for additional requirements.

1.16 ELECTRICAL REQUIREMENTS:

A. Furnish internal wiring for components of packaged equipment as an integral part of the equipment.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 OBTAIN AND PAY FOR ALL PERMITS, AND INSPECTIONS, INCLUDING ANY INDEPENDENT TESTING REQUIRED TO VERIFY STANDARD COMPLIANCE, AND DELIVER CERTIFICATES FOR SAME TO CONSTRUCTION ADMINISTRATOR. ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF NFPA 70, CA PUC G.O. 95, CA PUC G.O. 128, TITLE 24, CALIFORNIA CODE OF REGULATIONS (CCR) & UBC 1994.

3.2 WORK RESPONSIBILITIES

A. Proper judgment must be exercised in executing the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference with structural conditions. The Contractor is responsible for the correct placing of his work and the proper location and connection of his work in relation to the work of other trades. Advise appropriate trade as to locations of access panels.

B. In the event changes in the indicated locations or arrangements are necessary, due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without extra cost, providing the change is ordered before the conduit runs, etc. and work directly connected to same is installed and no extra materials are required.

C. Where equipment is furnished by others, verify dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.

D. Do not install light outlets or fixtures until mechanical piping and duct work is installed; then lights shall be installed in locations best suited for equipment arrangement or as directed by the Construction Administrator.

E. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with any work, carefully check and verify all dimensions, sizes, etc. with the shop drawings to see that the equipment will fit into the spaces without violation of applicable codes.

F. Should any changes to the work in narrative and specifications be necessary in order to comply with the above requirements, notify the Construction Administrator immediately until approval for any required modifications to the construction has been obtained from Construction Administrator.

G. Be responsible for any cooperative work which must be altered due to lack of proper supervision or failure to make proper provisions in time. Such changes shall be under direction of the Construction Administrator and shall be made to his satisfaction.

H. Perform all work with competent and skilled personnel.

I. All work, including aesthetic as well as electrical and mechanical aspects of the work, shall be of the highest quality consistent with the best practices of the trade.

J. Replace or repair, without additional compensation, and any work which, in the opinion of the Construction Administrator, does not comply with these requirements.

3.3 CONTINUITY OF SERVICE

A. No interruption of service to any part of existing facilities will be permitted without express permission in each instance from Construction Administrator. Request for outages shall state specific date and hours and the maximum duration, with outages kept to these specific date and hours and the maximum duration. Contractor is responsible to provide adequate temporary power (Portable Generator) for unforeseen cases when the outage period exceeds permitted outage duration at no cost to the Owner.

B. If overtime is necessary, there will be no allowance made by Construction Administrator for extra expense for such overtime or shift work, due to maintaining continuity of service herein required.

C. Organize work to minimize duration of power interruption.

3.4 PAINTING OF EQUIPMENT

A. Factory Applied: Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test, except equipment specified to meet requirements of ANSI C37.20 shall have a finish as specified in ANSI C37.20.

B. Field Applied: Paint electrical equipment as required to touch up, to match finish on other equipment in adjacent spaces or to meet safety criteria.

3.5 RECORD DRAWINGS

A. Shop drawings shall be provided detailing location of all electrical panels, equipment, junction boxes, conduit, lighting, receptacles, and other connected devices. Panel schedules, circuit numbers and all other electrical information shall be clearly indicated on drawings. Drawings shall be in AutoCAD format meeting Campus standards

3.6 SHORT CIRCUIT, COORDINATION, AND ARC FLASH STUDY

A. The contractor shall engage the services of a qualified organization to provide a building system short circuit and protective device coordination study for the electrical distribution system. The coordination study shall coordinate with the Owner's medium voltage distribution system and include all components down to and including panelboards. The independent organization shall have been engaged in full practice for a minimum of ten years, and be submitted for approval.

B. Provide arc flash label and calculations per IEEE 1584 and NFPA 70E recommendations and requirements.
   1. Arc Flash label shall consist of, but not limited to:
      a. "DANGER – Arc Flash and Shock Hazard, Appropriate PPE Required"
      b. Calculated values of flash protection boundary, incident energy, working distance, required PPE level, shock hazard voltage, limited approach, restricted approach and prohibited approach and equipment ID.

2. The Contractor shall provide and install all required Arc Flash labels on equipment for this project. Arc Flash label content shall be approved by the Engineer prior to installation.

END OF SECTION 260500

SECTION 260519

LOW-VOLTAGE WIRES (600V AC)

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. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

A. Not used

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Alpha Wire.
   2. General Cable Technologies Corporation.
   3. Southwire Incorporated.

C. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

D. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2 or Type XHHW-2.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Hubbell Power Systems, Inc.
   2. Ideal Industries, Inc.
   3. O-Z/Gedney; a brand of the EGS Electrical Group.
   4. 3M; Electrical Markets Division.
   5. Tyco Electronics.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.

B. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

3.4 CONNECTIONS

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

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
   1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections:
1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

D. Test and Inspection Reports: Prepare a written report to record the following:
1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

E. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

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. Section Includes: Grounding systems and equipment.

B. Section includes grounding systems and equipment, plus the following special applications:
1. Overhead-line grounding.
2. Underground distribution grounding.
3. Ground bonding common with lightning protection system.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

A. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "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.

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

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
1. Instructions for periodic testing and inspection of grounding features at test wells and grounding connections for separately derived systems based on NE TA MTS.
a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.

b. Include recommended testing intervals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable 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. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches by 12 in (minimum) cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

A. Listed and labeled by an NRTL 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, 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.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet 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. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
1. Install bus on insulated spacers 2 inches 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, and down to specified height above floor; connect to horizontal bus.

D. 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 according to written instructions 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. Flexible raceway runs.
5. Armored and metal-clad cable runs.
6. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
7. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.
1. 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.
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus.
3. 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. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "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.

D. 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 bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. 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; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by 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.

F. 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.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

H. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 3/0 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's grounding grid or to grounding electrode external to concrete.

3.5 LABELING

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
   1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
   3. 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. Make tests at ground rods before any conductors are connected.
      a. Measure ground resistance no fewer 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.
   4. 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.

E. Grounding system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Report measured ground resistances that exceed the following values:
   1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
   2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
   3. Substations and Pad-Mounted Equipment: 5 ohms.
   4. Manhole Grounds: 10 ohms.

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

END OF SECTION 260526

SECTION 260543

UNDERGROUND DUCTS AND RACEWAYS 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 the following:
1. Conduit, ducts, and duct accessories for direct-buried and concrete-encased duct banks.
2. Handholes and boxes.
3. Manholes.

1.3 DEFINITION

A. RNC: Rigid nonmetallic conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:
1. Duct-bank materials, including separators and miscellaneous components.
2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Accessories for manholes, handholes, boxes.
4. Warning tape.

B. Shop Drawings for Precast or Factory-Fabricated Underground Utility Structures: Include plans, elevations, sections, details, attachments to other work, and accessories, including the following:
1. Duct entry provisions, including locations and duct sizes.
2. Reinforcement details.
3. Frame and cover design and manhole frame support rings.
4. Grounding details.
5. Dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
6. Joint details.

C. Shop Drawings for Factory-Fabricated Handholes and Boxes Other Than Precast Concrete: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:
1. Duct entry provisions, including locations and duct sizes.
2. Cover design.
3. Grounding details.
4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

A. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.
   1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
   2. Drawings shall be signed and sealed by a qualified professional engineer.

B. Product Certificates: For concrete and steel used in precast concrete manholes and handholes, as required by ASTM C 858.

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

D. Source quality-control test reports.

E. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Comply with ANSI C2.

C. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store precast concrete underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast concrete units only at designated lifting or supporting points.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
   1. Notify Owner no fewer than 14 days in advance of proposed interruption of electrical service.
   2. Do not proceed with interruption of electrical service without Owner's written permission.

1.9 COORDINATION

A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.

B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks as determined by coordination with

other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.2 NONMETALLIC DUCTS AND DUCT ACCESSORIES

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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
1. Cantex, Inc.
2. CertainTeed Corp.; Pipe & Plastics Group.
3. Condux International, Inc.
4. ElecSys, Inc.
5. Spiraduct/AFC Cable Systems, Inc.

D. Duct Accessories:
1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."

2.3 PRECAST CONCRETE HANDHOLES AND BOXES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Oldcastle Precast Group.
2. Utility Concrete Products, LLC.
3. Utility Vault Co.

B. Comply with ASTM C 858 for design and manufacturing processes.

C. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
1. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.

2. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
3. Cover Legend: Molded lettering, "ELECTRIC."
4. Configuration: Units shall be designed for flush burial and have closed bottom, unless otherwise indicated.
5. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
    a. Extension shall provide increased depth of 12 inches.
    b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.
6. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches vertically and horizontally to accommodate alignment variations.
    a. Windows shall be located no less than 6 inches from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
    b. Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
    c. Window openings shall be framed with at least two additional No. 4 steel reinforcing bars in concrete around each opening.
7. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
    a. Type and size shall match fittings to duct or conduit to be terminated.
    b. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.
8. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.4 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Description: Comply with SCTE 77.
1. Color: Gray.
2. Configuration: Units shall be designed for flush burial and have closed bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC."
6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
7. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Fiberglass Handholes and Boxes with Polymer Concrete Frame and Cover: Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
    a. Armorcast Products Company.
    b. Carson Industries LLC.
    c. Christy Concrete Products.
    d. Synertech Moulded Products, Inc.; a division of Oldcastle Precast.

2.5 Note not used

2.6 UTILITY STRUCTURE ACCESSORIES

A. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Capable of withstanding temperature of 300 deg F without slump and adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

2.7 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

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

PART 3 - EXECUTION

3.1 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Cables Over 600 V: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank, unless otherwise indicated.

B. Ducts for Electrical Feeders 600 V and Less: RNC**,** NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.

C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.

D. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank, unless otherwise indicated.

3.2 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less:
1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.
2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.

4. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf vertical loading.

3.3 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses" and Section 329300 "Plants."

D. Cut and patch existing pavement in the path of underground ducts and utility structures according to Section 017329 "Cutting and Patching."

3.4 DUCT INSTALLATION

A. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.

B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, at other locations, unless otherwise indicated.

C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

D. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.
   1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
   2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole.
   3. Grout end bells into structure walls from both sides to provide watertight entrances.

E. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

G. Pulling Cord: Install 100-lbf- test nylon cord in ducts, including spares.

H. Concrete-Encased Ducts: Support ducts on duct separators.
   1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
   2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
      a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
      b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing rod dowels extending 18 inches into concrete on both sides of joint near corners of envelope.
   3. Pouring Concrete: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.
   4. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
   5. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
   6. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and signal ducts.
   7. Depth: Install top of duct bank at least 24 inches below finished grade in areas not subject to deliberate traffic, and at least 30 inches below finished grade in deliberate traffic paths for vehicles, unless otherwise indicated.
   8. Stub-Ups: Use manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Extend concrete encasement throughout the length of the elbow.
   9. Stub-Ups: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
      a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
      b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.
   10. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

I. Direct-Buried Duct Banks:
   1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
   2. Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.

3. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches in nominal diameter.
4. Install backfill as specified in Section 312000 "Earth Moving."
5. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
6. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
7. Depth: Install top of duct bank at least 36 inches below finished grade, unless otherwise indicated.
8. Set elevation of bottom of duct bank below the frost line.
9. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
10. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
    b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
11. Warning Planks: Bury warning planks approximately 12 inches above direct-buried ducts and duct banks, placing them 24 inches o.c. Align planks along the width and along the centerline of duct bank. Provide an additional plank for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional planks 12 inches apart, horizontally.

3.5 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Precast Concrete Handhole and Manhole Installation:
1. Comply with ASTM C 891, unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:
1. Manhole Roof: Install with rooftop at least 15 inches below finished grade.
2. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch above finished grade.
3. Install handholes with bottom below the frost line
4. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
5. Where indicated, cast handhole cover frame integrally with handhole structure.

C. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

D. Manhole Access: Circular opening in manhole roof; sized to match cover size.
   1. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.
   2. Install chimney, constructed of precast concrete collars and rings to support frame and cover and to connect cover with manhole roof opening. Provide moisture-tight masonry joints and waterproof grouting for cast-iron frame to chimney.

E. Dampproofing: Apply dampproofing to exterior surfaces of manholes after concrete has cured at least three days. Dampproofing materials and installation are specified in Section 071113 "Bituminous Dampproofing." After ducts have been connected and grouted, and before backfilling, dampproof joints and connections and touch up abrasions and scars. Dampproof exterior of manhole chimneys after mortar has cured at least three days.

F. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms,as required for installation and support of cables and conductors and as indicated.

G. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inches for manholes and 2 inches for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

H. Warning Sign: Install "Confined Space Hazard" warning sign on the inside surface of each manhole cover.

3.6 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.

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

C. Elevation: In paved areas and trafficways, set so cover surface will be flush with finished grade. Set covers of other handholes 1 inch above finished grade.

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

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

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

G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screened to top of box cover frame. Bottom of ring shall rest on compacted earth.
   1. Concrete: 3000 psi, 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.
   2. Dimensions: 10 inches wide by 12 inches deep

3.7 GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:
   1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
   2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
   3. Test manhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.9 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 260543

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

C. Medium voltage cable tags.

D. Underground warning tape.

E. Conduit markers.

F. Warning Signs.

1.2 APPLICABLE PUBLICATIONS:

The following publications form a part of this specification. The publications are referred to in the text by the basic designation only.

A. American National Standards Institute, Inc. (ANSI) Publications:
1. C2-99 National Electrical Safety Code
2. Z35.1-97 Safety Color Code
3. Z35.2-97 Environmental and Facility Safety Signs
4. Z35.5-97 Accident Prevention Tags (for Temporary Hazards)

B. State of California Administrative Code:
1. Title 8, Industrial Relations
2. Title 24, Part 3, CCR, California Electrical Code

C. National Fire Protection Association (NFPA) Publication:
1. 70-2008 National Electrical Code (NEC)

1.3 SUBMITTALS

A. Submit under provisions of Division 1 and 26 05 00.

B. Product Data: Provide data for:
1. Nameplates
2. Wire/Cable markers
3. Medium voltage cable tags
4. Underground warning tape
5. Conduit markers

C. Field Samples: Provide for:

1. Nameplates: (1) sample
2. Wire/Cable markers: (1) sample
3. Medium voltage cable tags: (1) sample
4. Underground warning tape: (1) sample, 24" long
5. Conduit markers: (1) sample
6. Property ID Labels: see Section 2.7

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Nameplate designations shall clearly state:
   1. Manufacturer's nameplate including equipment design rating of current, voltage, kVA, HP, bus bracing rating, or as applicable.
   2. Equipment nameplate designating system usage and purpose, system nominal voltage, equipment rating for kVA, amperes, HP and RPM as applicable.
   3. Receptacles and lighting switches (wiring devices): Panel designation and circuit number.

B. Nameplates shall be melamine plastic, 0.125-inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering into the black core. Minimum size of nameplates shall be 1.0 inch by 2.5 inches except that wiring device nameplates shall be 0.5 inch by 1.5 inch. Lettering shall be normal block style unless otherwise noted.

C. Nameplates shall be secured permanently with screws.

D. Letter Size:
   1. Use 0.25 inch letters for identifying individual equipment and loads.
   2. Use 0.50 inch for identifying grouped equipment and loads.

2.2 WIRE MARKERS

A. Description: Heat shrinkable, flame-retarded, crosslinked polyolefin wire marker. Wire tags shall have a dielectric strength of 500 V/mil minimum and a temperature range from -30°C to 105°C. Thermoplastic or wraparound tags are not acceptable. All tags shall be printed using a 9 or 24 pin dot matrix printer. Raychem ShrinkMark™, Brady Permasleeve or approved equal.

B. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number per design builder drawings.

2.3 UNDERGROUND WARNING TAPE:

A. The tape shall be 6" wide x 0.004" polyethelene plastic with a metallic core detection tape. The tape shall be of a bright color contrast with soil, with identifying printing on one side. The

imprint shall read "Caution (type of utility) Line Buried Below". The identifying lettering shall be repeated continuously the full length of the tape. Seton style 6ELE, THOR Enterprises or approved equal.

2.4 CONDUIT MARKERS:

A. ANSI Z35.1 G.2. Pressure-sensitive, adhesive-backed vinyl markers with fade-proof ultraviolet inhibitors, black characters on orange background. 2.25" x 9" marker with 1.5" high letters. Marker shall read "4160 VOLTS" depending on circuit phase-to-phase voltage. Carlton Industries type EM-1, Seton Code Electrical Markers style AA, Brady B-500 series or approved equal.

2.5 MV CABLE TAGS (WHERE AFFECTED)

A. Provide as indicated on the plans.

2.6 WARNING SIGNS: ANSI Z35.1, Z35.2 AND Z35.5.

A. Warning signs shall be minimum 18 gauge steel white porcelain enamel finish with red lettering. Lettering to read "DANGER - HIGH VOLTAGE" with "DANGER" in 1-1/2" letters and "HIGH VOLTAGE" in 1" letters. New warning signs shall be provided on door/gate or immediately above door of all electrical equipment rooms, vaults, closets or outdoor substations containing equipment energized above 150 volts to ground, except where such spaces are accessible from public areas.

B. Warning designations in 1" red letters shall be painted by stencil or pre-printed adhesive on each new pull box or cabinet stating "DANGER" and giving voltage of enclosed conductors such as "DANGER - 5000 VOLTS", for all systems over 150 volts to ground.

C. A warning sign showing “ELECTRICAL ROOM – NO STORAGE PERMITTED” shall also be provided at the entrance of each electrical room.

2.7 PROPERTY ID LABELS FOR EQUIPMENT

A. List of Equipment for Property ID Labels:
1. Submit list of equipment of property ID labels, including location, function, equipment manufacturer’s name, and model and serial numbers for verification by Engineer. After acceptance by engineer, submit hard and electronic copies for assignment of bar-coding identification numbers by Campus Facility Services.
2. Samples: Submit two property ID labels
3. Closeout submittals: Record actual locations of labeled items; include bar-code numbers, and provide as-built electronic copy of list of equipment with location, function, equipment manufacturer’s name, and model and serial numbers.
4. Convene minimum two weeks prior to commencing work of this section

B. Labels
1. Material: Anodized Aluminum
2. Size: 2x0.875 inches
3. Attachment: Adhesive backed
4. Message: Printed identification

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

B. Coordinate installation of nameplates, markers and warning signs with the sequence of painting. Refer to Section for, "Painting."

3.2 NAMEPLATES

A. Provide laminated plastic nameplates for all electrical equipment and devices including, but not limited to, the following:
   1. Enclosures for switchgear, medium voltage controllers, transformers, low voltage switchgear, motor control centers, variable frequency drives, panels, panelboards, busway, pull boxes, junction boxes, cabinets and motors.
   2. Enclosures for all separately enclosed devices including but not limited to disconnect switches, circuit breakers, contactors, time switches, control stations and relays.
   3. All receptacles and lighting switches.
   4. Special systems such as but not limited to telephone, warning and signal systems. Identification shall be at each equipment rack, terminal cabinet, control panel, annunciator, and pull box.
   5. Devices mounted within and part of an equipment including circuit breakers, switches, control devices, control transformers, relays, indication devices and instruments.

B. Mounting: Provide number, location, and letter designation of nameplates as indicated. Install nameplate parallel to equipment lines. Fasten nameplates to enclosures with a minimum of two sheet-metal screws or two rivets. Fasten nameplates to device plates with suitable adhesive. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

3.3 WIRE MARKERS:

A. Provide markers for each conductor at panelboard gutters, pull boxes, junction boxes, outlet boxes, and each load connection.

3.4 UNDERGROUND WARNING TAPE:

A. Identifying tapes shall be buried in all utility line trenches. Each trench shall have one tape above the centerline of each duct. In non-paved areas, the tape shall be located approximately 8" below the final finish grade. In areas where paving is to be installed, the tape shall be placed immediately below the paving or its sub-base.

3.5 CONDUIT MARKERS:

A. Provide markers on all exposed conduit for circuits greater than 600 volts. Provide markers at lengths not greater than 20 feet on center.

3.6 MV CABLE TAGS (WHERE AFFECTED):

A. All new cables installed shall be identified at each end and at all accessible points in between (such as manholes, pull boxes, switchgear, etc.). Identify existing cables that are being re-routed or changed with new tags. Modification of existing tags shall not be acceptable.

3.7 WARNING SIGN MOUNTING:

A. Signs shall be permanently mounted with cadmium plated steel screws or nickel-plated brass bolts.

END OF SECTION 260553

SECTION 260923
DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Digital Lighting and Plug Load Controls
2. Relay Panels

B. Related Sections:
1. Section 262726 - Wiring Devices
2. Section 265600 – Exterior Lighting
3. Drawings and general provision of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section
4. Electrical Sections, including wiring devices, apply to the work of this Section.

C. Control Intent – Control Intent includes, but is not limited to:
1. Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.
2. Initial sensor and switching zones
3. Initial time switch settings

1.2 REFERENCES

A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) (www.ansi.org and www.ieee.org)

B. International Electrotechnical Commission (IEC) (www.iec.ch)

C. International Organization for Standardization (ISO) (www.iso.ch):

D. National Electrical Manufacturers Association (NEMA) (www.nema.org)

E. WD1 (R2005) - General Color Requirements for Wiring Devices.

F. Underwriters Laboratories, Inc. (UL) (www.ul.com):
1. 508 – Industrial Controls
2. 916 – Energy Management Equipment

G. Underwriter Laboratories of Canada (ULC) (www.ulc.ca)

1.3 SYSTEM DESCRIPTION & OPERATION

A. The Lighting Control and Automation system as defined under this section covers the following equipment:
1. Digital Occupancy Sensors (where required) – Self-configuring, digitally addressable, calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.

2. Digital Lighting Relay Panel– Provides up to 4 or 8 mechanically latching relays. Relays include a manual override and a single push-on connector for easy installation or removal from the panel. Panel accepts program changes from interface of date and time, location, holidays, event scheduling, button binding and group programming.

1.4 LIGHTING CONTROL APPLICATIONS

A. Unless relevant provisions of the applicable local energy codes are more stringent, provide a minimum application of lighting controls as follows:
1. Time-clock relay/controller with astronomical, 365-day programming.

1.5 SUBMITTALS

A. Submittals Package: Submit the shop drawings, and the product data specified below at the same time as a package.

B. Product Data: Catalog sheets, specifications and installation instructions.

1.6 QUALITY ASSURANCE

A. Manufacturer: Minimum 10 years experience in manufacture of lighting controls.

1.7 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
1. Ambient temperature: -40°F to 155°F.

1.8 WARRANTY

A. Provide a five year limited manufacturer’s warranty on all room control devices and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:
1. Basis of design product: Intermatic or subject to compliance and prior approval with specified requirements of this section, one of the following:
a. Tork

2.2 NOTE NOT USED

2.3 NOTE NOT USED

2.4 NOTE NOT USED

2.5 NOTE NOT USED

2.6 NOTE NOT USED

2.7 NOTE NOT USED

2.8 NOTE NOT USED

2.9 NOTE NOT USED

2.10 NOTE NOT USED

2.11 NOTE NOT USED

2.12 NOTE NOT USED

2.13 NOTE NOT USED

2.14 NOTE NOT USED

2.15 NOTE NOT USED

2.16 NOTE NOT USED

2.17 NOTE NOT USED

PART 3 - EXECUTION

3.1 CONTRACTOR INSTALLATION AND SERVICES

A. Contractor to install all devices and wiring in a professional manner. All line voltage connections to be tagged to indicate circuit and switched legs.

B. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated. Before start up, contractor shall test all devices to ensure proper communication.

3.2 FACTORY SERVICES

A. Upon completion of the installation, the manufacturer's factory authorized representative shall start up and verify a complete fully functional system.

B. The electrical contractor shall provide both the manufacturer and the electrical engineer with three weeks written notice of the system start up and adjustment date.

C. Upon completion of the system start up, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

3.3 ACCEPTANCE TESTING SUPPORT SERVICES

A. On all California projects, a certified lighting controls acceptance test technician (CLCATT) must verify the installation of the lighting control system. Manufacturer should include an extra day of factory technician's time to assist the CLCATT review the functionality and settings of the lighting control hardware per the requirements in the California State forms. It will be the CLCATT's responsibility to create and complete any forms required for the commissioning process, although the manufacturer or contractor may offer spreadsheets and/or printouts to assist the CLCATT with this task.

END OF SECTION 260923

SECTION 262726

WIRING DEVICES

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. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Weather-resistant receptacles.
4. Wall-switch and exterior occupancy sensors.
5. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Products: Subject to compliance with requirements, provide the following:
a. Cooper; 5351 (single), CR5362 (duplex).
b. Hubbell; HBL5351 (single), HBL5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.4 GFCI RECEPTACLES

A. General Description:
1. Straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
1. Products: Subject to compliance with requirements, provide the following:
   a. Cooper; VGF20.
   b. Hubbell; GFR5352L.
   c. Pass & Seymour; 2095.
   d. Leviton; 7590.

2.5 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
1. Products: Subject to compliance with requirements, provide the following:
   a. Cooper; CWL520R.
   b. Hubbell; HBL2310.
   c. Leviton; 2310.
   d. Pass & Seymour; L520-R.

2.6 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:
1. Products: Subject to compliance with requirements, provide the following: Catalog numbers in lists below are for 20-A devices; revise catalog numbers to require other configurations and ratings.
   a. Single Pole:
      1) Cooper; AH1221.
      2) Hubbell; HBL1221.
      3) Leviton; 1221-2.
      4) Pass & Seymour; CSB20AC1.

2.7 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic .
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.8 FINISHES

A. Device Color:
1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:
1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.

9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Nonfusible switches.
2. Receptacle switches.
3. Shunt trip switches.
4. Molded-case circuit breakers (MCCBs).
5. Molded-case switches.
6. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
1. Wiring Diagrams: For power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.
1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Manufacturer's field service report.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.9 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NFPA 70.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
1. Notify Owner no fewer than 14 days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Owner's written permission.
4. Comply with NFPA 70E.

1.11 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 NOTE NOT USED

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

2.3 SHUNT TRIP SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Bussmann, Inc.
2. Ferraz Shawmut, Inc.
3. Littelfuse, Inc.

B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.

C. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

D. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power source of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
   1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
   2. Outdoor Locations: NEMA 250, Type 3R.
   3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
   4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

E. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges

END OF SECTION 262816

SECTION 26 50 10

ARCHITECTURAL LIGHTING FIXTURES, LAMPS, BALLASTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide and install lighting fixtures as shown on drawings and as specified in this and all related Sections.

1.2 DEFINITIONS

A. The term Architect refers to the Architect, Interior Designer, Lighting Designer or Owner's Representative individually or collectively.

1.3 GENERAL REQUIREMENTS

A. Provide all lighting fixtures as shown complete with all lamps, completely wired, controlled and securely attached to supports.

B. Where a catalog number and a narrative or pictorial descriptions are provided, the written description shall take precedence and prevail.

C. General Contractor shall provide electrical subcontractor with entire lighting specification (including fixture illustrations and sketches); electrical subcontractor shall provide each specified manufacturer with complete information about the fixtures they will supply.

D. Type of fixtures shall be as indicated alphanumerically and as specified.

E. Fixture details shown may be modified by the manufacturer provided all of the following conditions have been met:

1. Fixture performance is equal or improved;
2. Structural, mechanical, electrical, safety, and maintenance characteristics are equal or improved;
3. Cost to the Owner is reduced or equal.
4. Modifications have been reviewed by the Architect and have been approved by the Architect in writing.

1.4 STANDARDS

A. The standards and regulating committees referred to in this specification and to which compliance with is required are:

1. UL Underwriters Laboratories
2. NRTL Nationally Recognized Testing Laboratory
3. NEC National Electric Code

4. ANSI American National Standards Institute
5. ASTM American Society of Testing and Materials
6. NEMA National Electrical Manufacturers Association
7. IEC International Electrotechnical Commission

B. All fixtures and assembled components shall be new, of good quality, and be approved by and bear the label of UL for the applicable location and conditions (wet, damp, dry, etc.) or other approved testing agencies, i.e. CSA, ETL, unless otherwise specified in writing.

C. All fixtures shall meet all required local, state and/or national building, electrical and energy codes and regulations.

1.5 BIDDING

A. Follow bidding procedures as described in Division 01 of this specification.

B. Provide unit and alternate prices as required in the Lighting Fixture Schedule at the end of this section.

1.6 SUBSTITUTIONS

A. Bidders' attention is called to the following procedure to be followed in submitting alternate fixture manufacturers than those specified:

1. Bidders wishing to obtain approval on brands other than those specified by name and/or catalog number in the Lighting Fixture Schedule at the end of this section, shall submit their requests not later than ten (10) business days before the bid opening. Approval will be in the form of an addendum to the specifications issued to all prospective bidders indicating that the additional brand or brands are approved as equal to those specified as far as the requirements of the project are concerned. If the bidders do not elect to obtain prior approval during the time so specified, the Owner has no obligation to review or consider any such article after the contract award.
2. If the bidder wishes to substitute fixtures from alternate manufacturers, his attention is called to Section 2.01, GENERAL MATERIAL REQUIREMENTS of PART 2 - PRODUCTS. In addition, he shall note that the dimensions of visible parts of many fixtures (for example, the aperture diameters of incandescent fixtures) are binding to the bidder and cannot be changed without prior approval by the Architect.
3. Contractor shall pay professional fees (at current standard hourly rates) and reimburse expenses directly to all designers (Architect, Engineer, Lighting Designer, et. al.) for time spent reviewing substitutions proposed by the Contractor. If payment by the Contractor is not made within 60 days of invoice date, the Owner shall deduct the amount due from subsequent payments to the Contractor in order to reimburse designers.
4. Request for approval shall be accompanied by working fixture samples (with an appropriate lamp, complete photometric, mechanical and electrical data, list of materials and finishes and unit cost to the Owner) of both the specified brand and the proposed substitutes as required to make complete comparison and evaluation. These samples shall be in addition to those required by Lighting Fixture Specification. The above data shall be delivered separately to the Architect and the Lighting Designer. The fixture samples shall be furnished and installed, at the bidder's expense, at the location selected by the Architect. In addition, the bidder shall furnish the Architect and the Lighting Designer with the name and location of at least one completed project where each proposed substitute has been in operation for a period of at least six (6) months, as well

as the names and addresses of the Owner, the Lighting Designer and the Architect of record.

1.7 SUBMITTALS

A. For standard catalog items with no modifications, submit catalog cut sheets prepared by the manufacturer which clearly show all elements to be supplied and all corresponding product data (including lamping; ballast manufacturer and model number; voltage; accessories or options and any miscellaneous items detailed in the written description of the specification.) If cut sheet shows more than one (1) fixture type, all non-applicable information shall be crossed out.

B. For standard cataloged fixtures:

1. Submit one sample cone for each fixture type for review. Submit a certificate of compliance with Alzak finish requirements with all requests for approval.
2. When more than one louver panel occurs in a fixture, submit as a part of shop drawings the dimensioned layout of individual louver panels and supporting "tee" members.

C. For custom fixtures, modified fixtures or linear fluorescent fixtures mounted in continuous rows, submit an engineered line drawing prepared by the manufacturer showing all details of construction, lengths of runs, lamping layout, pendant locations, power locations, finishes and list of materials. Drawings must be to scale. Contractor shall provide manufacturer with field dimensions where required. If scallop shields, wallwash reflectors or baffles are required, drawings shall indicate relative position to wall or adjacent vertical surface.

D. For all submittals under paragraphs A through C above, manufacturer shall provide submittals with fixture installation instruction sheets.

E. For all submittals under paragraphs A through C above, manufacturer shall provide submittals within two weeks of receipt of order. All submittals shall have project name and fixture type clearly shown.

F. Fixture cuts and shop drawings shall be submitted in quantities and format as described in the general conditions section the specification.

G. The Architect shall make the final determination as to whether or not the submittal contains sufficient information and reserves the right to request a shop drawing if the fixture cut is insufficient.

1.8 MOCK-UPs

A. It shall be the responsibility of the Contractor to provide a mock-up of the lighting fixture or lighting systems as indicated in the fixture description. The mock-up shall be erected within a time period and in a location that is acceptable to the Architect.

B. The mock-up installation shall closely conform to the conditions of the actual installation as to: height, distance from ceiling, number and type of lamps, material, color and etc. The Contractor shall submit a written description of each proposed mock-up with drawings in order to obtain the Architect's approval prior to commencement of each mock-up.

C. The purpose of the mock-up will be to study the general appearance and performance of the intended lighting systems. At that time, certain minimal test variations may be requested as to lamp location, lamp type, reflector shape, color and etc. Final modifications, if any, shall be

considered a part of these Specifications and shall be accomplished with no additional cost to the Owner.

1.9 SAMPLES

A. It shall be the responsibility of the Contractor to provide a sample(s) fixture as indicated in the Lighting Fixture Schedule at the end of this section. When samples are called for the manufacturer shall provide two working samples complete with lamp, ballast (rated for 120 Volt operation) and 6' pig-tail with 3-prong Edison plug.

B. The sample(s) shall be shipped to a location that is determined by the Architect. Shipping and return shipping costs shall be provided as part of the contract.

C. The purpose of the sample is to review manufacturing techniques, detailing, lamping and scale. Sample fixtures must be approved prior to fabrication of fixtures for the project. Minor modifications, if any, shall be considered part of these Specifications and shall be accomplished with no additional cost to the Owner.

D. Sample fixtures may not be used on the project.

1.10 EXTRA STOCK

A. Furnish to the Owner and store at the site where directed, extra stock of each type of lighting fixture type and lamp type installed in the Project in quantities as required by Owner, packaged in manufacturer's unopened cartons and identified as to contents by fixture type.

B. Furnish items above with appropriate quantity of each exposed trim, fastener, bracket and other items as required for a complete installation.

1.11 WARRANTIES

A. All fixtures and workmanship shall be guaranteed free of defects and fully operational for a minimum of one year after the acceptance of the project by the Owner. Any fixtures or workmanship found to be defective during the warranty period will be either fixed or replaced by the Contractor at no cost to the Owner.

B. Ballasts for fluorescent fixtures shall be covered by a five year warranty and high intensity discharge fixtures shall be covered by a two year warranty against defects in workmanship or material. Warranty shall include in-warranty service program providing for payment of authorized labor charges incurred in replacement of inoperative, in- warranty ballasts.

PART 2 - PRODUCTS

2.1 GENERAL MATERIAL REQUIREMENTS

A. Ferrous mounting hardware and accessories shall be finished using either a galvanic or phosphate primer/baked paint process to prevent corrosion and discoloration of adjacent materials.

B. For weatherproof and vapor-tight installation, painted finishes of fixtures and accessories shall be weatherproof enamel using proper primers or hot dipped galvanized and bonderized epoxy, in accordance with manufacturer's requirements. Unless otherwise specified all painted surfaces shall have a life expectancy of not less than twenty years.

1. Hangers shall be conduit with chemically resistant, weatherproof, baked enamel finish.
2. Where dissimilar metal parts come in contact with each other, apply to both surfaces a coating material to prevent corrosion.
3. Colors shall be as specified in the Lighting Fixture Schedule at the end of this section.

C. Fasteners shall be manufactured of non-magnetic stainless steel or anodized aluminum, except in indoor applications where galvanized steel shall be acceptable.

D. Fixtures shall be free of light leaks and shall be designed to provide sufficient ventilation of lamps and ballasts including vent holes where required.

E. Outdoor fixtures shall have wire mesh corrosion resistant screens in the vent holes properly sized to prevent incursion of insects, small animals, and/or other small rodents.

F. All sheet metal work shall be free from tool marks and dents and shall have accurate angles bent as sharp as compatible with the gauges of the required metal. All intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion after assembly. All sheet metal shall be free of light leaks. All edges shall be finished so there are no sharp edges exposed. All miters shall be in accurate alignment with abutting intersecting members. Piecing of plates in individual runs in single planes and the use of spliced pieces or filler material to cover defective workmanship shall not be acceptable. Sheet metal work shall be properly fabricated so that planes will not deform (i.e. become concave or convex, due to normal expected ambient and operating conditions).

G. Lampholders shall hold lamps securely against normal vibrations and maintenance handling. Provide solid nickel or nickel-and-silver-plated contacts in lampholders for the following types of lamps:

1. Mogul screw base incandescent, metal halide, and high pressure sodium.
2. Lamps in outdoor fixtures.
3. Tungsten-halogen lamps.

H. Wiring channels and lampholder mountings shall be rigid and accurately made.

I. Reflector Cones:

1. Provide 45 degree lamp and lamp image cut-off unless otherwise specified. In fixtures where upper reflector is separate from cone, cut-off shall be 45 degrees unless otherwise specified.
2. Plastic materials shall not be used for reflector cones or aperture plates.
3. Fixtures in which reflector cones are riveted or welded to housing or where removal of cone requires pressure to be applied to finished surface of reflector shall not be acceptable.
4. Cone flange shall be formed as an integral part of the cone and shall have identical color and finish as the cone, except as shown. The flange major surface shall be perpendicular to the cone axis. The width of the flange shall adequately cover the ceiling opening without light leaks. No fixture parts (housing, mounting frame, etc.) shall be visible between the ceiling surface and the edge of the cone flange. The same requirement shall be applicable to fixtures where main reflector extends down to the

bottom edge of the fixture without a separate cone. In such case, the flange shall be formed as an integral part of the main reflector.

5. Reflector cones shall be manufactured of uniform gauge, not less than 0.032-inch thick, high purity aluminum Alcoa 3002 alloy free of spin marks or other defects or blemishes caused during manufacturing.
6. The finish of the inner surface of the reflector shall be highly specular as produced under the Alzak process. The reflector shall have an anodic coating of not less than four mils thick. The reflector inner surface shall be free of water spotting and shall maintain a reflectivity ratio of not less than 85percent on clear specular finish. The reflector shall have a low iridescence finish free from multiple colors seen from normal viewing angles. Colors shall be derived from dyes supplied by Sandoz Chemical Company or approved equal.
7. The reflecting surface of the cone shall be tested for proper sealing. Test per ASTM B136-63T.
8. Fixtures with Alzak reflector cones, unless otherwise specified, must be furnished by the same manufacturer.
9. Reflector cone retention devices shall not deform cone in any manner whatsoever.
10. Submit a certificate of compliance with Alzak finish requirements with all requests for approval.

J. Lenses:

1. Fresnel:

   a. Lens shall have uniform brightness throughout the entire visible area at angles from 45 degrees to 90 degrees from vertical, without bright spots or striations.
   b. Lens shall have opaque risers; color shall be as specified in the Lighting Fixture Schedule at the end of this section.
   c. Finish of visible regress surface of door shall be matte baked enamel paint, special color as selected by Architect.
   d. All fixtures with fresnel lenses, unless otherwise specified, must be furnished by the same manufacturer.

2. Glass:

   a. Flat glass lenses shall be heat tempered borosilicate glass unless otherwise noted.
   b. Glass finishes, i.e. sandblasting, etching, polishing shall be performed as described in the fixture description.

3. Acrylic:

   a. Lenses shall be of injection molded crystal clear material 100% virgin acrylic (except as shown). For lenses with male pattern of pyramids or cones, specified minimum thickness refers to distance from flat surface to base of pyramids (cones), or thickness of undisturbed material. For lenses with female pattern, specified minimum thickness refers to overall thickness of material.
   b. Lenses shall fully eliminate lamp images when viewed from all directions within the 45 degrees to 90 degrees angle from vertical when the ratio of lamp spacing to the distance from lamp underside to top of lens does not exceed 1.50. Within the viewing angle from 0 degrees to 45 degrees the ratio of maximum brightness (under a lamp) to minimum brightness (between lamps) shall not exceed 3 to 1.
   c. Finishes, i.e. sandblasting, etching, polishing shall be performed as described in the fixture description.

K. Incandescent Fixtures:

1. Incandescent fixtures, unless otherwise specified, shall be operated at 90 percent of rated lamp voltage by means of a bucking transformer at the distribution panel for extended lamp life. Bucking transformers shall not be used on those circuits where dimmers are used. Refer to Electrical Engineers drawings and Specifications for manufacturer, quantity and size of bucking transformers required. (Refer to the Lighting Fixture Schedule at the end of this section for lamp voltages.)
2. Housing:

a. Steel, bonderized or equal rust protected or aluminum, rigid construction. Minimum gauge thickness shall be as follows:

1) Interior locations: No. 20 gauge steel, No. 16 gauge aluminum.
2) Exterior locations: No. 18 gauge steel, No. 14 gauge aluminum.

b. Finish: Baked enamel finish (except when otherwise specified).

1) Concealed interior surfaces (this applies to interior hardware, lampholders, yokes, brackets, etc.): matte black.
2) Concealed exterior surfaces: matte black.
3) Visible surfaces: color and texture as specified below for each fixture type or as selected.
4) Exterior Fixture Finishes:

a) Unless otherwise specified, all painted surfaces shall have an outdoor life expectancy of not less than 20 years. Surfaces shall be prepared, primed, and material applied in accordance with the manufacturer's requirements.
b) Color: Colors shall be as specified under the Lighting Fixture Schedule at the end of this section.

3. Reflector Cones: refer to "Reflector Cones", above.
4. Reflectors not visible within normal viewing angles shall be highly specular as produced under the Alzak process, except when otherwise specified. Minimum reflectance shall be 85 percent.
5. Provide safety devices for removable fixture elements (cones, reflectors, lenses and fixture doors, etc.). Safety devices shall support removable elements when not in normal operating position, and be detachable if necessary. This device shall not interfere with fixture performance, maintenance, or the seating of any fixture element, and shall not be visible during normal fixture operation.
6. Thermal protection device shall be provided as required by code.

L. Solid State Lighting / Light Emitting Diode (LED) Lamps and Luminaires:

1. General:

a. Luminaire manufacturer shall have a minimum of five (5) years experience in the manufacture and design of LED products and systems and no less than one hundred (100) North American installations.
b. Unless otherwise specified, all LED luminaires and power/data supplies shall be provided by a single manufacturer to ensure compatibility.
c. All components, peripheral devices and control software are to be provided by and shall be the responsibility of a single entity. All components shall perform

successfully as a complete system and shall operate as described in Lighting Designer's Control Narrative documents or the Lighting Fixture Schedule at the end of this section.

d. Provide submittals as described in Part 1 above.

e. Include all components necessary for a complete installation. Provide all power supplies, synchronizers, data cables, and data terminators for a complete working system.

f. All LED sources used in the LED luminaire shall be of proven quality from established and reputable LED manufacturers and shall have been fabricated after 2007. Acceptable LED lamp manufacturers unless otherwise noted are:

1) Cree, Inc.
2) Philips Lighting
3) Nichia Corporation
4) Norlux
5) Opto Technology, Inc.
6) Osram Optronic Semiconductors

2. Replacement and Spares:

a. Manufacturer shall provide written guarantee of the following:

1) Manufacturer will keep record of original bin for each LED module and have replacement modules from the same bin available for three (3) years after date of installation.
2) Manufacturer will keep an inventory of replacement parts (source assembly, power and control components).
3) Manufacturer's LED system will not become obsolete for ten (10) years: Manufacturer will provide exact replacement parts, or provide upgraded parts that are designed to fit into the original luminaire and provide equivalent distribution and lumen output to the original, without any negative consequences.

b. All parts of system shall replaceable in field. Manufacturer shall provide written guarantee of the following:

1) Manufacturer has in place a written recycling and re-use program, and will accept returned product and/or components for recycling or re-use.
2) Manufacturer will properly dispose of non-recyclable components that are deemed harmful to the environment.

c. System shall carry a full warranty for five (5) years. Manufacturer shall be responsible for cost of labor not to exceed $50 per individual part, and cost of shipping, to replace any component of the system that fails within 2 years of installation.

3. Products and Components – Performance

a. LED luminaires and components shall be UL listed or UL classified.
b. LED luminaires and components shall be CE certified.
c. LED luminaires and components shall be PSE marked.
d. All LED luminaires shall be subjected to the following JEDEC Reliability Tests for Lead-free Semiconductors: HTOL, RTOL, LTOL, PTMCL, TMSK, Mechanical Shock, Variable Vibration Frequency, SHR, Autoclave.

e. To ensure luminaire quality, luminaire shall have been tested under accelerated life test conditions including an operating temperature span of 360 degrees Fahrenheit, and cyclic loading up to 60G.

f. All products included in system shall use Mil-Std 810F, Random Vibration 7.698g as a minimum standard. In installations subject to vibration, luminaire shall be installed with vibration isolation hardware to sufficiently dampen vibrations.

g. All LED components shall be mercury and lead-free.

h. All manufacturing processes and materials shall conform to the requirements of the European Union's Restriction on the Use of Hazardous Substances in Electrical and Electronics Equipment (RoHS) Directive, 2002/95/EC.

i. LEDs shall comply with ANSI/NEMA/ANSLG C78.377-2008 – Specifications for the Chromaticity of Solid State Lighting Products. Color shall remain stable throughout the life of the lamp. Color shall match approved sample.

j. LEDs shall comply with IESNA LM-80 – Standards for Lumen Maintenance of LED Lighting Products

k. White LEDs shall have a rated source life of 50,000 hours under normal operating conditions. RGB LEDs shall have a rated source life of 100,000 hours. LED “rated source life” is defined as the time when a minimum of 70 percent of initial lumen output remains.

l. Luminaire assembly shall include a method of dissipating heat so as to not degrade life of source, electronic equipment, or lenses. LED luminaire housing shall be designed to transfer heat from the LED board to the outside environment. Luminaire housing shall have no negative impact on life of components.

m. Manufacturer shall supply in writing a range of permissible operating temperatures in which system will perform optimally.

n. High power LED luminaires shall be thermally protected using one or more of the following thermal management techniques: metal core board, gap pad, and/or internal monitoring firmware

o. LEDs shall be adequately protected from moisture or dust in interior applications.

p. For wet and damp use, LED-based luminaires itself shall be sealed, rated, and tested for appropriate environmental conditions, not accomplished by using an additional housing or enclosure. Such protection shall have no negative impact on rated life of source or components, or if so, such reductions shall be explicitly brought to the attention of the designer.

q. All hardwired connections to LED luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.

r. The LED luminaire shall be operated at constant and carefully regulated current levels. LEDs shall not be overdriven beyond their specified nominal voltage and current.

s. RGB LED luminaires shall utilize an equal combination of high brightness red, blue and green LEDs, unless otherwise noted, to provide up to 16.7 million additive RGB colors and shall be capable of at least 8-bit control.

t. Manufacturer shall be able to provide supporting documentation of the product meeting third party regulatory compliance.

u. Manufacturer shall ensure that products undergo and successfully meet appropriate design and manufacturability testing including Design FMEA, Process FMEA, Environmental Engineering Considerations and Laboratory Tests, IEC standards and UL/CE testing.

v. All LED luminaires (100 percent of each lot) shall undergo a minimum twenty-four (24) hour burn-in during manufacturing, prior to shipping.

w. Manufacturer shall provide Luminaire Efficacy (lm/W), total luminous flux (lumens), luminous intensity (candelas) chromaticity coordinates, CCT and CRI. optical performance, polar diagrams, and relevant luminance and illuminance photometric

data. Provide data in IES file format in accordance with IES LM-79-2008, based on test results from an independent Nationally Recognized Testing Laboratory.

x. Power / data supply shall have the following:

1) Supply outputs shall have current limiting protection.
2) Supply shall provide miswiring protection.
3) Supply shall have power factor correction.
4) Supply shall provide connections that are conduit-ready or clamp-style connections in the case of low-voltage wiring.
5) Supply shall come with a housing that meets a minimum IP20 rating for dry location installation unless located in a damp or wet location.
6) Supply shall be UL listed for Class 1 or Class 2 wiring

M. Wiring:

1. Voltage Rating

a. For voltages up to 120 volts fixture wiring shall be rated for 300 volts minimum.
b. For voltages above 120 volts fixture wiring shall be rated for 600 volts minimum.

2. Temperature Rating - Internal to Fixture

a. All wiring shall be code-approved for fixture wiring, and shall comply with the following temperature ratings unless fixture design or local codes require higher temperature wire.
b. Incandescent

1) minimum rated between lampholder(s) and separately mounted junction box or internal transformer.
2) minimum rated between internal transformer and separately mounted junction box.
3) Tungsten-halogen lamp seal temperature shall not exceed 350 degrees Celsius at ambient of 25 degrees Celsius when tested per UL Bulletin 57, Par. 328-334. Submit certified heat test data by independent testing laboratory.

3. Temperature Rating - External to Fixture

a. All flexible cord wiring between fixture components or to electrical receptacle and not in wireways shall have a minimum temperature rating of 105 degrees Celsius.
b. Cord type shall be suitable for application and shall be fitted with proper strain relief and watertight entries where required by application.

4. Splices

a. Splices internal to fixture shall be made within separate splice compartments and shall utilize nylon insulated crimped connections or insulated quick disconnects.
b. Splices to branch circuit wiring in separate junction boxes shall utilize flame retardant thermoplastic caps with fully seated helical metal spring and threaded entry.

5. No internal wiring shall be visible at normal viewing angles, i.e., above 45 degrees from vertical. Use additional wire clamps if necessary. Anticipate increased visibility if fixtures are mounted on or recessed within a sloping surface.
6. Any fixture fed from more than one panel, i.e., for normal and night or emergency operation, shall have separate neutrals to each panel.
7. Furnish code-approved wiring in ceiling cavities forming air plenums.

N. Lamps:

PART 3 - EXECUTION

3.1 SHIPPING AND STORAGE

A. All fixtures received at the site shall be stored in clean and dry space until fixtures are installed.

B. Manufacturer shall clearly mark each box with fixture designation prior to shipping.

C. Reflector cones, baffles, louvers, aperture plates, and decorative elements of fixtures shall be packed by the manufacturer separate from the housing (body, stem, etc.) of the fixture.

3.2 LOCATION

A. Locations of fixtures are shown diagrammatically. Verify exact location and spacing with Reflected Ceiling Plans and other reference data before ordering of fixtures and during installation.

B. Notify Architect about field conditions at variance with Contract Documents before commencing installation.

C. Coordinate space conditions with other trades before ordering of fixtures.

D. Pendant mount, as approved, surface type fixtures where required to meet space conditions.

E. Coordinate length of continuous-run fluorescent fixtures with adjacent walls, partitions, coffers and other architectural elements as required.

1. Continuous runs shall be defined as the optimal combination of 3’ and 4’ lamp length as necessary to complete runs with no more than 6” of free space at either end of the run as provided by the contractor.

3.3 INSTALLATION

A. Provide accessories as required for ceiling construction type indicated on Finish Schedule. Fixture catalog numbers do not necessarily denote specific mounting accessories for type of ceiling in which a fixture may be installed.

B. Provide adequate and sturdy support for each lighting fixture. Contractor shall be responsible for verifying weight and mounting method of all fixtures and furnish and install suitable supports. Fixture mounting assemblies shall comply with all local seismic codes and regulations.

C. Install rows of fixtures accurately on straight lines unless otherwise indicated on drawings. Coordinate with mechanical work.

D. Install fixtures with vent holes free of air blocking obstacles.

E. Where plaster ceilings occur, furnish plaster frames for setting under other applicable sections. Direct the setting and be responsible for correct location; make sure the bottom of frame is flush with finished ceiling, forming screed edge for finished plaster.

1. Fixtures shall be supported by plaster frames utilizing yokes or leveling lugs.

a. Fixtures and support elements shall not be mounted to or in contact with ducts or pipes.
b. Yoke shall have channel cross section of sufficient gauge, and shall support a fixture by means of not fewer than two (2) bolts each.

2. If air diffusers are located in common continuous rows with lighting fixtures in plaster ceilings, furnish plaster frames of proper length to accommodate diffusers.
3. Lighting fixtures recessed in ceilings which have a fire resistive rating of one hour or more shall be enclosed in a box which has a fire resistive rating equal to that of the ceiling.

F. Contractor shall be responsible for adjusting aperture rings on all ceiling recessed fixtures to accommodate various ceiling material thickness. Contractor shall responsible for coordinating the cut-out size in ceiling to ensure aperture covers cut-out entirely. The bottom of aperture rings shall be flush with finished ceiling or not more that 1/16" above. Under no circumstances will the aperture ring extend below the finished ceiling surface.

G. For fixtures with variable position lampholder assemblies Contractor shall confirm prior to installation proper lampholder (socket) position in field, and shall adjust, if necessary, after coordination with manufacturer.

H. Surface Mounted Fixtures: Support surface mounted fixtures from structural members other than ceiling tees.

I. Pendant Mounted Fixtures:

1. Pendant mounted fixtures shall be supported from structural framework of ceiling or from inserts cast into slab.
2. All pendants shall have swivel aligners located at the top ends; pendants shall be 1/2-inch rigid steel conduit unless specifically indicated otherwise on drawings or in specifications.
3. All linear pendant and surface mounted fixtures shall be supported with two (2) supports per four foot section or three (3) per eight foot section unless otherwise recommended by manufacturer.

J. Bracket Mounted Fixtures: For each bracket fixture, provide flanged metal stem attached to outlet box, with threaded end suitable for supporting the fixture rigidly in design position. Flanged part of fixture stud shall be of broad base type, secured to outlet box at not fewer than three (3) points.

K. Mask the trims and bottoms of all lighting fixtures if necessary to protect the fixture during construction.

L. At the completion of construction clean the bottoms, the trim, the reflecting surfaces, lenses, baffles, louvers and reflector cones of all lighting fixtures so as to render them free of any

material, substance or film foreign to the fixture. If the luminaires are deemed dirty by the Architect at the completion of the project, the Contractor shall clean them at no additional cost to the Owner. Luminaire components whose finishes are damaged shall be replaced at no cost to the Owner.

M. Ascertain and ensure that all lamps installed are exactly as specified for each fixture type.

N. Replace all burned-out or inoperative lamps, and inoperative ballasts in all high intensity discharge and fluorescent fixtures before the building is accepted by the Owner so that all lighting fixtures will be in first-class operating condition.

O. Provide labor and materials for final aiming of all adjustable fixtures under the Architect's supervision. Aiming shall take place immediately before building is turned over to Owner, after regular working hours where required.

Type	Description	Mfr / Catalog No.	Finish	Lamping	Electrical Data	Notes
F1	Concrete pad-mounted LED "lantern" bollard, nominal 36" height, wet-rated Location: Path Entrances	Pace Illumination AIMEE-4500-36"-24WLED-VOLTAGE-MOD WHITE-DBZ-BM-MOD ART GLASS-MOD FASTENERS	Standard Bronze or Custom Landscape Architect to select	24W LED Module 3000K +/- 75K CCT 80+ CRI 50,000hr+ L70	Integral Power Supply Input Watts: 24	1. Fixture to be U.L. listed and labeled "suitable for wet locations." 2. Provide finish sample plate for review and approval. 3. Manufacturer to provide bolt template for concrete pad mounting. Anchor bolts by others, to be made of stainless steel. Below-grade structural support to be determined by a licensed electrical engineer. 4. Fixture to be provided with a white reflector and art glass lens as well as countersunk and tamper-proof fasteners. Final glass specification to be determined through sample review. 5. Allow for extra stock of the LED lamp module and power supply. Provide extra stock as required by owner.
F2	Concrete pad-mounted louvered LED bollard with asymmetric or symmetric distribution and replaceable LED module, 32" nominal overall height Location: Paths	Kim Lighting CB32-15L-3K-U-DB-MOD TAMPER, FINISH FASTENERS	Standard Bronze or Custom Landscape Architect to select	19W LED Module 3000K +/- 75K CCT 80+ CRI 50,000hr+ L70	Integral Power Supply Input Watts: 19	1. Fixture to be U.L. listed and labeled "suitable for wet locations." 2. Provide finish sample plate for review and approval. 3. Manufacturer to provide bolt template for concrete pad mounting. Anchor bolts by others, to be made of stainless steel. Below-grade structural support to be determined by a licensed electrical engineer. 4. Fixture to be provided with tamper-resistant countersunk fasteners in the same finish as the fixture. 5. Allow for extra stock of the LED lamp module and power supply. Provide extra stock as required by owner. 6. Fixture to be provided with tamper-resistant countersunk fasteners in the same finish as the fixture. 7. Fixture was specified with 180-deg distribution ("15L") but mockup was 360-degree distribution ("20L"). Either is acceptable for light levels on path, Architect/Owner to select.
F3	Ingrade-mounted LED adjustable landscape uplight, nominal 7" aperture, wet-rated Location: Trees	Lumascape L5853LED-20H6-A-G-82-M-28-WIRE ENTRY-9 L56012 Louver	Polished Brass Stainless Steel - polished or brushed - Landscape Architect to select	20W LED Module 2900K +/- 75K CCT 80+ CRI 50,000hr+ L70	Integral Power Supply Input Watts: 20	1. Fixture to be U.L. listed and labeled "suitable for wet locations." 2. Provide brushed brass cover. 3. Provide wire entry option per contractor. 4. Provide 30 degree optics and cross hatch louver. 5. Final fixture location to be determined in the field by Lighting Designer & Landscape Architect based on installed tree canopy, roots etc.
F3b	Similar to Type F3 but with a different optic, in hardscape Location: Block 18 Pergola	Lumascape L5853LED-20H6-G-K-CONNECTOR-NM-28-Q-9 L5688 Wallwash Lens	Polished Brass Stainless Steel - polished or brushed - Landscape Architect to select	20W LED Module 2900K +/- 75K CCT 80+ CRI 50,000hr+ L70	Integral Power Supply Input Watts: 20	1. Refer to Type F3 Notes.
F3c	Similar to Type F3 but with a different optic, in hardscape Location: Block 18 Pergola	Lumascape L5853LED-20H6-G-K-CONNECTOR-NM-28-Q-9 L5688 Wallwash Lens	Polished Brass Stainless Steel - polished or brushed - Landscape Architect to select	20W LED Module 2900K +/- 75K CCT 80+ CRI 50,000hr+ L70	Integral Power Supply Input Watts: 20	1. Refer to Type F3 Notes.
F8	Surface mounted LED strip underbench lighting, remote transformer, wet-rated Location: Block 13	Optic Arts FLEXDC-68-30-24-30-(lengths)/CHS-S-1922R-(mounting)/(Power Supply)	N/A	3 watt/ft Warm White LED (3000K, 286.77 lumnes/ft	Remote Power Supply	1. Povide 3 watts/ft fixture package. 2. Provide fixture with 3000K CCT. 3. Refer to Achitectural Drawings for fixture length(s). 4. Provide fixture with IP68 rating for wet location. 5. Contractor to verify and coordinate fixture mounting with Architectual details and field conditions. 6. Locate remote transformer in a secure, concealed, accessible and well ventilated location in compliance with manufacturer's recommendations. 7. Contractor & manufacturer to coordinate transformer size and wire gauge to limit voltage drop to ≤2% over entire length of run. 8. Electrical to confirm driver compatibility with specified control system.

GENERAL NOTES:

1. Provide all lighting fixtures as shown complete with all lamps, completely wired, controlled and securely attached to supports.
2. Where both narrative and/or pictorial fixture descriptions are provided, the written description shall take precedence and prevail.
3. The lighting fixtures and workmanship must be in accordance with and meet the standards and regulations of the following: a.) Underwriters Laboratories b.) National Electric Code c.)Local Building and Life Safety Code Agencies.
4. All fixtures and workmanship shall be guaranteed free of defects and fully operational for a minimum of one year after the acceptance of the project by the Owner. Any fixtures or workmanship (excluding lamps) found to be defective during the warranty period will be either fixed or replaced by the Contractor at no cost to the Owner.
5. Locations of fixtures are shown diagrammatically. Verify exact location and spacing with Plans and designer at the site during installation. Notify Owner about field conditions at variance with Contract Documents before commencing installation.
6. Provide adequate and sturdy support for each lighting fixture. Contractor shall be responsible for verifying weight and mounting method of all fixtures and furnish and install suitable supports. Fixture mounting assemblies shall comply with all local seismic codes and regulations.
7. At the completion of construction, clean lenses and reflectors of all lighting fixtures so as to render them free of any material, substance or film foreign to the fixture. Blemished, damaged, or unsatisfactory fixtures shall be replaced in a satisfactory manner.
8. Replace all burned-out or inoperative lamps, and inoperative ballasts in all fixtures before the building is accepted by the Owner so that all lighting fixtures will be in first class operating condition.
9. Contractor to review existing circuiting, verify new loads and panel capacity. Contractor shall notify Owner if a conflict between design documents and field conditions occur.
10. For all fixtures that are dimmed refer to electrical drawings for information on controls and dimming requirements. Provide appropriate dimming system based on load type. Contractor to provide all required components for a fully functioning system.
11. Contractor to provide line item pricing per fixture type with labor and installation shown as line items.
12. Refer to electrical drawings for Voltage information.
13. All fixtures to have countersunk temperproof screws.
14. Per section 265010 Part III/U: For all adjustable fixtures provide labor and materials for final aiming and locking of all adjustable fixtures under the Architect's supervision. Aiming shall take place immediately before building is turned over to Owner, after regular working hours where required.

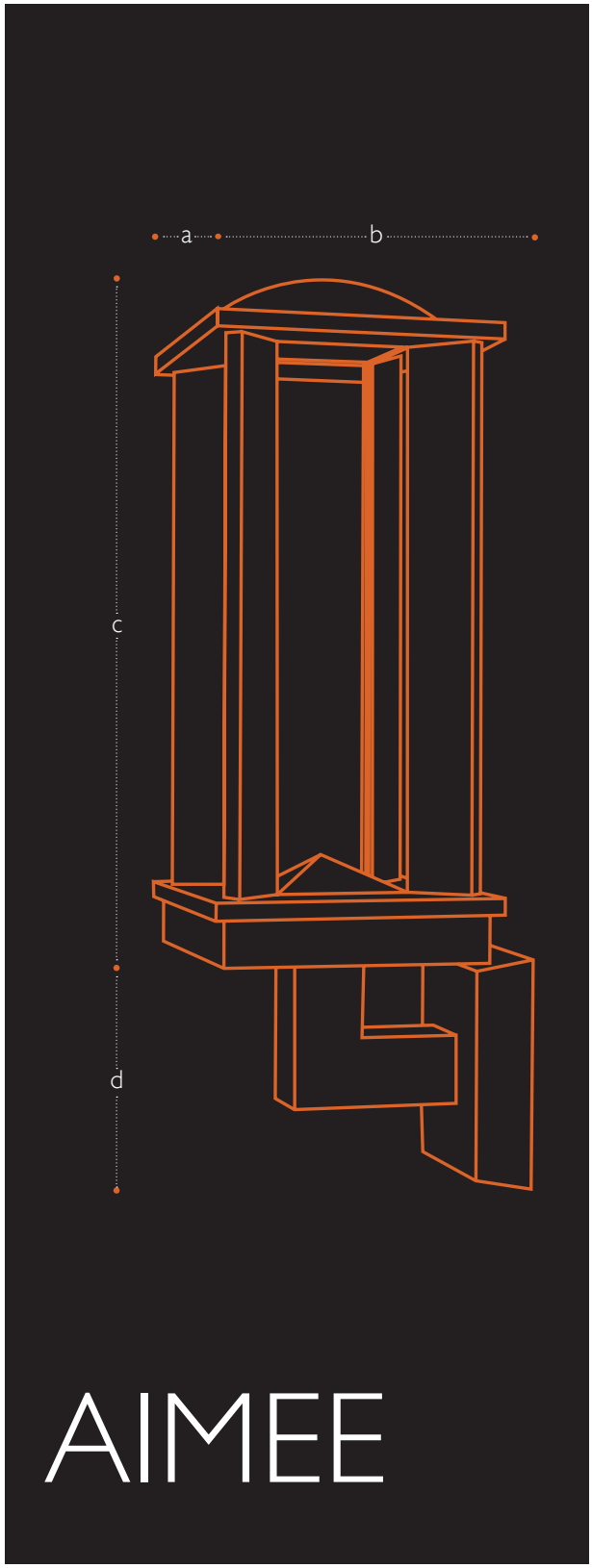
Project: Beverly Garden Parks
Block 13

HLB Project #: 16089

Date: 22 December, 2016
Submittal: 100% CD/BID SET

Type: F1

LIGHTING CONTROL CUT SHEET Note: This document is for information only. Refer to specifications for all catalog numbers, etc.



AIMEE

REFINED. POWERFUL. ROBUST.

PACE

Dimensions

Wall mount
(a) Width small 8" large 8"
(b) Depth to wall small 10" large 10"
(c) Height small 14" large 18"
(d) Mount 7 5/8"

Bollard mount
(a) Width small 8" large 8"
(b) Depth to wall small 8" large 8"
(c) Height small 36" large 42"

A refined design,

with powerful capabilities, the Aimee luminaire is a versatile fixture. The robust aluminum construction complements the glow of the concealed LED light source. The design, combined with a tempered glass internal lens, makes the Aimee a perfect light for use in commercial or residential outdoor environments.

paceillumination.com

Project:	Beverly Garden Parks Block 13	Date: 22 December, 2016 Submittal: 100% CD/BID SET	Type: F1
HLB Project #:	16089		

LIGHTING CONTROL CUT SHEET Note: This document is for information only. Refer to specifications for all catalog numbers, etc.

ORDERING CODE GUIDE

AIMEE NOTES:

For an online quote form go to:
http://www.paceillumination.com/aimee.php

Enter option codes above

SERIES	MODEL	HEIGHT	LAMP	VOLTAGE	REFLECTOR	FINISH	MOUNTING
AIMEE	4500	36" (BM)	18WLED	120	Pebbletone	TAL textured aluminum	BM bollard mount
		42" (BM)	24WLED	277		TBK textured black	WM wall mount
		14" (WM)				TBZ textured bronze	
		18" (WM)				TWH textured white	
						AL silverdillo	
						BK black	
						BY buttercup yellow	
						DBZ dark bronze	
						DO deep orange	
						EG emerald green	
						RB royal blue	
						RR rich red	
						WH white	
						RAL colors available	

5500 West 111th Street | Oak Lawn, Illinois 60453 | USA | Telephone: 800.441.1771

KIM LIGHTING

CB LED

Compact Bollard

revision 7/28/14 • kl_cbled_spec.pdf

Type:
Job:
Catalog number:

/ / /
Fixture | Electrical Module | Luminaire Finish | Option

See page 2

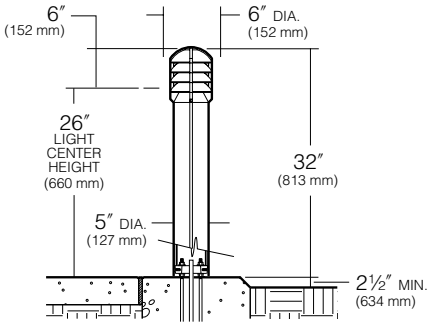
Approvals:

Date:

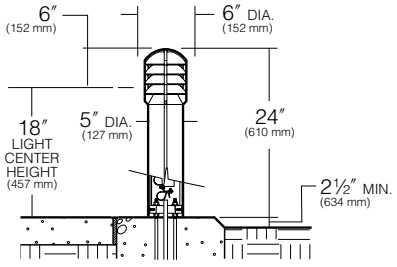
Specifications

CB Models
10 to 20 Diodes

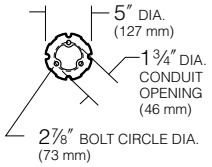
CB32
Maximum weight: 20 lb



CB24
Maximum weight: 17 lb



BASE PLAN CB



HUBBELL
HUBBELL LIGHTING, INC.

Top, Louvers: Interlocking die-cast, low-copper (<0.6% Cu) aluminum sections fasten together with concealed stainless steel screws. Louver base assembly fastens internally to riser with 4 concealed screws.

Riser: Extruded aluminum, 5″ diameter, .125″ typical wall thickness, external vertical grooves align with vertical members on louver assembly. Attaches to anchor base with 4 countersunk stainless steel flat socket head screws finished to match fixture.

Anchor Base: Heavy cast aluminum, fully concealed within riser shaft. Three ⅜″ x 10″+ 2″ zinc plated anchor bolts, each with two nuts and washers, and a rigid pressboard template.

Globe: Internally fluted, clear tempered glass, fully gasketed.

Optical Module: Each LED equipped with a directional optic for maximum beam angle projecting through louver stack spacings. LED boards to be mounted to an anodized inter-locking heat sink extrusion. (Type I) two 5-LED boards for a total of 10-LED. (Type III) three 5-LED boards for a total of 15-LED. (Type V) four 5-LED boards for a total of 20-LED. Available in 580nm Amber, 3000K, 4200K and 5100K color temperatures.

Electronic Module: All electrical components are either UL or ETL recognized, mounted on a single plate and factory prewired with quick disconnect plugs. Driver is rated for -40°F starting and has a 0-10V dimming interface for multi-level illumination options.

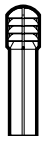
Finish: Each luminaire receives a fade and abrasion resistant, electrostatically applied, thermally cured, triglycidal isocyanurate (TGIC) polyester powdercoat finish. Standard colors include (BL) Black, (DB) Dark Bronze, (WH) White, (PS) Platinum Silver, (SG) Stealth Gray, (LG) Light Gray, and (CC) Custom Color (Include RAL#).

Listed to: UL 1598 Standard for Luminaires - UL 8750 Standard for Safety for Light Emitting Diode (LED) Equipment for use in Lighting Products and CSA C22.2#250.0 Luminaires. RoHS compliant. Meets Buy American provisions within ARRA.

Warranty: Kim Lighting warrants Bollard LED products sold by Kim Lighting to be free from defects in material and workmanship for (i) a period of five (5) years for metal parts, (ii) a period of five (5 years for exterior housing paint finish(s), (iii) a period of five (5) years for LED Light Engines and, (iv) a period of five (5) years for LED power components (driver, surge protector and LifeShield® device), from the date of sale of such goods to the buyer as specified in Kim Lighting shipment documents for each product.

CAUTION: Fixtures must be grounded in accordance with national, state and/or local electrical codes. Failure to do so may result in serious personal injury.

KIM LIGHTING RESERVES THE RIGHT TO CHANGE SPECIFICATIONS WITHOUT NOTICE



Standard and Optional Features

Fixture
Cat. No. designates fixture.

Cat. No. ☐ **CB24** Compact Bollard 24″ overall height
☐ **CB32** Compact Bollard 32″ overall height

Electrical Module
LED = Light Emitting Diode

Cat. Nos. for LED Electrical Modules available:

xL
Source:
- ☐ **10L**= 10 LED (IES Type I)
- ☐ **15L**= 15 LED (IES Type III)
- ☐ **20L**= 20 LED (IES Type V)

xK
Color Temperature:
- ☐ 2K = 580nm - Amber
- ☐ 3K = 3000K
- ☐ 4K = 4200K
- ☐ 5K = 5100K

UV
Voltage:
- ☐ **UV** Universal Voltage shall range from 120V-277V

Finish
TGIC thermoset polyester powder coat paint on fixture and shaft

Color:	Black	Dark Bronze	Light Gray	Stealth Gray	Platinum Silver	White	Custom Color[1]
Cat. No.:	☐ **BL**	☐ **DB**	☐ **LG**	☐ **SG**	☐ **PS**	☐ **WH**	☐ **CC**

NOTE: Black and Dark Bronze colors will produce slightly less louver brightness than Light Gray or White.

[1]Custom colors subject to additional charges, minimum quantities and extended lead times. Consult representative. Custom color description: _____

Battery Back-up
Cat. No. ☐ **EM**
☐ **No Option**

Internal battery pack provides 90 minutes of supplemental light at 50% of initial lamp lumens.

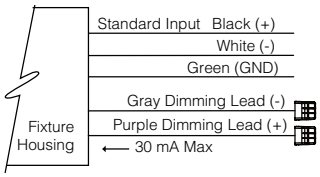
Battery Back-up

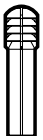
Optional Duplex Receptacle
Cat. No. ☐ **DR**
☐ **DR-GFI**
☐ **No Option**

(CB32 only) Mounted 18″ from bottom of shaft, in a cast aluminum box that is internally welded and sealed with a gasketed While-In-Use cover with locking tab. Painted to match bollard.
DR weather proof duplex receptacle rated 20A, 125V.
DR-GFI weather proof duplex receptacle with ground fault circuit interrupter rated 20A, 125V.

0-10V Dimming Interface

Driver has a 0-10V dimming interface with a dimming range of 10-100%. Is compatible with most control systems including Hubbell Building Automation wiHUBB™. Approved dimmers include Lutron Diva AVTV, Lutron Nova NFTV and NTFTV. Note: Not compatible with current sourcing dimmers. Controls compatible via Gray and Purple dimming lead.





Lumen Data

Spectroradiometric			
	3000K Average	4200K Average	5100K Average
Correlated Color Temp. CCT (K)	2800K - 3175K	3800K - 4600K	4600K - 5600K
Color Rendering Index (CRI)	≥75	≥70	≥65
Power Factor	>.90	>.90	>.90

Projected Lumen Maintenance		
mA	50,000 hrs	100,000 hrs
350mA	N/A	N/A

Based on 20LED version.

Electrical Drive Current - @350mA						
	Type 1		**Type 3**		**Type 5**	
Volts - AC	Amps - AC	System Watts	Amps - AC	System Watts	Amps - AC	System Watts
120	0.11	13	0.16	19	0.21	25
208	0.06	13	0.09	19	0.12	25
240	0.05	13	0.08	19	0.10	25
277	0.05	13	0.07	19	0.09	25

B.U.G. Rating (TM15) in Lumens where B = Backlight, U = Uplight, G = Glare			
Temperature	TYPE 1	TYPE 3	TYPE 5
3000K	B0 U2 G1	B0 U2 G1	B1 U2 G1
4200K	B0 U2 G1	B0 U2 G1	B1 U2 G1
5100K	B0 U2 G1	B0 U2 G1	B1 U2 G1

Absolute Lumens			
Temperature	TYPE 1	TYPE 3	TYPE 5
3000K	403	533	795
4200K	499	705	985
5100K	525	740	1036

LED performance and lumen output continues to improve at a rapid pace. Log onto www.kimlighting.com to download the most current photometric files from Kim Lighting's IES File Library.
For custom optics and color temperature configurations, contact factory.

1300 Industrial Road, Unit #19
San Carlos, CA 94070
FREE CALL 1-866-695-5862 US & Canada
info@lumascape.com

LUMASCAPE USA INC.

LS853LED

Ingrade

humantouch™ gripglass™ OPTIONAL opticlear™ OPTIONAL microantileach™

CADdetails 0-10V OPTIONAL PWM DIM OPTIONAL IP68 IK10 Intertek

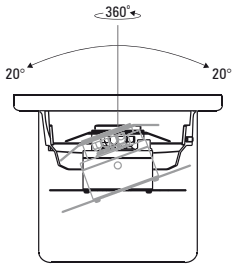
The LS853LED is a full featured, shallow depth ingrade luminaire featuring lumen output and efficacy exceeding metal halide. As an inherently protected luminaire it can be used in interior spaces and immediately adjacent to combustible materials (such as wood decking, etc). Dimming options include 0-10 V and PWM protocols, with various power input options, including 120-277 V. In addition, internal rotation and tilt adjustability ensures the most efficient light delivery can be set according to site conditions.

Specifications

Lamp Source	16 W or 20 W LED □ White (4 300 K typical) Warm white (3 000 K typical) Blue (470 nm) *Other colors by request* RGB
Approved Use	Suitable for wet locations Suitable for use in poured concrete Inherently protected
Lumen Maintenance (L70)	>60,000 hrs *Limited by TM-21 x6 rule*
Control Options	0-10 V PWM
IP Rating	IP68
Construction	316 marine grade stainless steel
Installation Types	**Pre-Installation Blockout** Concrete pour, drive-over & general use applications **Direct Burial** Landscapes, planters & special applications *(consult factory)*
Drive-over	With **OptiClear™** lens and pre-installation blockout (LS6052-K or LS6052-K-SP)
Static Load Rating	8 140 lb (3 700 kg) with **OptiClear™** lens and pre-installation blockout (LS6052-K or LS6052-K-SP) *(Load applied to center of glass across a 2" diameter area)*
Impact Rating	IK10 with **OptiClear™** lens
Standard Inclusions	Teflon coated cover screws **MicroAntiLeach™** wire entry
Accessories	**LS6052-K/LS6052-K-SP** Pre-installation blockout
Remote Transformers / Power Supplies *Order separately*	Refer to Technical Data section for application specific options
Ambient Operating Temperature	16 W -22 °F to 104 °F (-30 °C to +40 °C) 20 W -22 °F to 122 °F (-30 °C to +50 °C)
Surface Temperature	≤113 °F (45 °C)
Photometrics	Refer to www.lumascape.com

Any luminaire can become hot - take care with appropriate use and placement

LS853LED
with round flush cover



Project: Beverly Garden Parks
Block 13
HLB Project #: 16089

Date: 22 December, 2016
Submittal: 100% CD/BID SET

Type: F3 Series

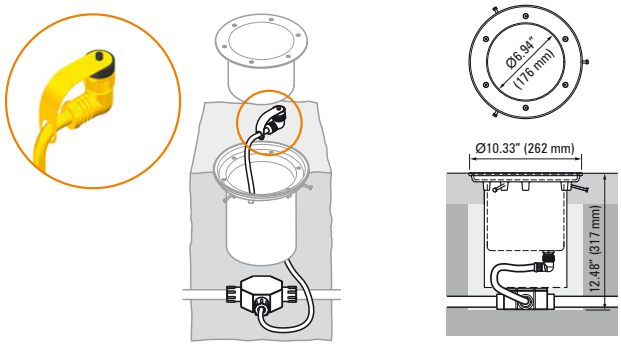
Why Use LS6052-K Pre-Installation Blockout?

The LS6052-K acts as a blockout, and is intended for installation before the luminaire, however it has other special functions. To simplify the installation, every LS6052-K is supplied complete with a 4-way, ¾" PVC junction box, inside which the installer can make all necessary connections, and allows the completion of all wiring even before the luminaire arrives on site. This method also ensures the luminaire itself is not damaged during concreting or other site works. ***Note: The junction box remains serviceable after installation***. To complete the installation, Lumascape provides an IP68 connector, enabling a tool-free final connection from the luminaire to the branch circuit. In addition, this connector is readily detachable, allowing for off-site maintenance.

Why Use LS6052-K-SP Pre-Installation Blockout?

The LS6052-K-SP pre-installation kit (order separately) is ideal for use in applications where maximum flexibility for the type and location of branch circuit connections are required or where exact site conditions may be unknown. The LS6052-K-SP is also for use with all applications requiring a color changing or dimmable lighting scheme. For use with the LS6052-K-SP, Lumascape provides the LS853LED complete with 6.5' of factory-installed hookup wire or an SOOW cord (both options include a **MicroAntiLeach™** seal). This provides the installer with greater flexibility to determine the type and location of the branch circuit connection. This option is also 100% hard-wired, and does not feature the IP68 detachable couplings for off-site maintenance. All aspects of the luminaire itself are still field serviceable.

Connection Type '85' for LS6052-K Pre-Installation Blockout



IP68 Connector & Junction Box

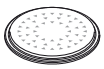
The luminaire is fitted with an IP68 connector, which attaches directly to the cord supplied with LS6052-K, without the use of any tools. The cord is 1.8' (0.56 m) in length, and is factory assembled with a 4 way, ¾" junction box - ***Remains field serviceable after installation.***

Not suitable for color changing or dimmable applications.

Lens Options

OptiClear™ Glass

Glass of very high optical purity and load strength. Suitable for walk-over and drive-over applications.



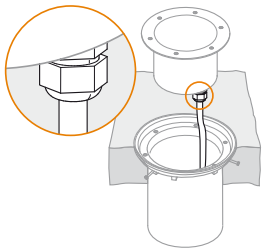
GripGlass™

OptiClear™ glass with slip reduction glazing process. Suitable for walk-over and drive-over applications.

Borosilicate Glass

Ideal for limited access locations. Not recommended for high traffic pedestrian areas.

Connection Type '84' for LS6052-K-SP Pre-Installation Blockout

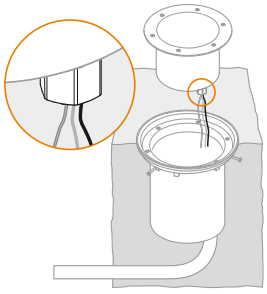


6.5' SOOW Cord

For connection to the branch circuit via junction box (by others) or other approved method.

c/w 6.5' SOOW Cord (16/3)

Connection Type '82' for LS6052-K-SP Pre-Installation Blockout



½" NPT Adapter

The luminaire is factory-fitted with 6.5' hookup wire. Ensure terminations can be made within this length.

For other length options, consult factory.

Cover Options for Pre-Installation Blockout

Flush covers for pre-installation use special seals and support bushes to ensure static loads up to 8 140 lb (3 700 kg) are properly supported. In order to achieve this drive-over rating, **OptiClear™** or **GripGlass™** must be used.

Pre-Installation Blockout Round Flush Cover

■ SS316: Polished ■ SS316: Brushed

Project: Beverly Garden Parks Block 13
HLB Project #: 16089

Date: 22 December, 2016
Submittal: 100% CD/BID SET

Type: F3 Series

LIGHTING CONTROL CUT SHEET Note: This document is for information only. Refer to specifications for all catalog numbers, etc.

Product	Lamp	Lens	Cover	Connection Type	Optical System	Housing Depth	Wire Entry Location	Input Voltage
LS853LED						29	Q	

LAMP

Description	Wattage	Color	Code
LED	16 W	White (4300 K typ.)	16W4
		Warm white (3000 K typ.)	16H6
		Blue (470 nm)	16B4
LED	20 W	White (4300 K typ.)	20W4
		Warm white (3000 K typ.)	20H6
		Blue (470 nm)	20B4
		RGB	20M4

OPTICAL SYSTEM

Description	Beam		Code
Adjustable	Narrow	14°	NR[1]
Adjustable	Narrow Medium	25°	NM
Adjustable	Medium	30°	ME[2]
Adjustable	Linear Horizontal	40° x 20°	LH[3]
Adjustable	Linear Vertical	20° x 40°	LV[3]

[1] Not available for RGB.
[2] Recommended for best RGB color mixing.
[3] Refer to beam orientation diagram.

HOUSING DEPTH

Description	Code
12.48" (317 mm)	29

WIRE ENTRY LOCATION

Description	Code
Bottom	Q

LENS

Description		Code
OptiClear™	Very high optical purity and load strength	A[1]
GripGlass™	OptiClear™ with slip reduction glazing process	G[1]
Borosilicate Glass	Ideal for limited access locations	X[2]

[1] Suitable for drive-over.
[2] Not suitable for drive-over.

INPUT VOLTAGE

Description	Code
120-277 V, 50/60 Hz	09[1]
0-10 V Dimmable Driver, 120-277 V, 50/60 Hz	09-DIM[1][2]
12-15 V, 60 Hz or 12-24 V DC	13[1][2][3]
PWM Dimmable Driver, 12 V, 60 Hz or 12-24 V DC	13-DIM[3]

[1] Not available for RGB.
[2] Not available with 16 W module.
[3] Requires appropriate transformer.

COVER

Description	Material	Finish	Code
Round Flush Cover	Stainless steel	Polished	M
		Brushed	N

Dimmable Wiring Diagram Reference

Input Voltage	LED Color	Control Type	Wiring Diagram
09-DIM	Single Color	0-10 V	1
13-DIM	Single Color	PWM	6
13-DIM	RGB	PWM	8,9

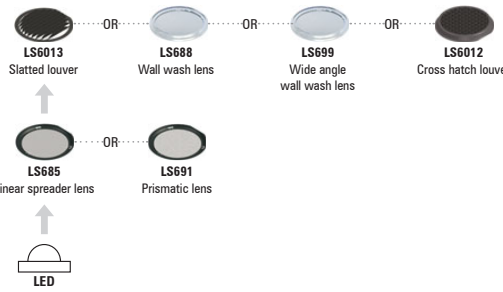
CONNECTION TYPE

Description	Code
IP68 Connector & Junction Box	85[1]
6.5' SOOW Cord	84[2]
½" NPT Adapter	82[2]

[1] Not suitable for color changing or dimmable applications. LS6052-K required - order separately.
[2] LS6052-K-SP required - order separately.

LS853LED Accessories

Stacking and order of accessories



Other accessory stacking options may be available - consult factory

Project: Beverly Garden Parks Block 13
HLB Project #: 16089

Date: 22 December, 2016
Submittal: 100% CD/BID SET

Type: F3 Series

LIGHTING CONTROL CUT SHEET Note: This document is for information only. Refer to specifications for all catalog numbers, etc.

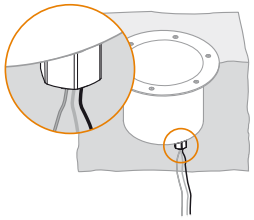
Why Use Direct Burial?

Direct burial installation is ideal for landscaping areas or for special applications where depth is restricted. This type of installation also allows for maximum heat dissipation. The 316 grade Stainless Steel construction of the luminaire performs flawlessly in alkaline and acidic soil types, and is also rated for use in concrete pour applications. **Note: This installation type has no option for a pre-installation blockout.**

Lumascape provides the LS853LED complete with 6.5' of factory installed hookup wire and ½" NPT adapter, supplied complete with **MicroAntiLeach™** seal. This provides the installer with greater flexibility to determine the nature of the branch circuit connection. This connection is also 100% hardwired. All aspects of the luminaire itself remain field serviceable.

Consult factory for application advice prior to using this configuration.

Connection type '82' for 'Direct Burial' housing



½" NPT Adapter

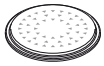
The luminaire is factory-fitted with 6.5' hookup wire. Ensure terminations can be made within this length.

For other length options, consult factory.

Lens Options

OptiClear™ Glass

Glass of very high optical purity and load strength. Suitable for walk-over and drive-over applications.



GripGlass™

OptiClear™ glass with slip reduction glazing process. Suitable for walk-over and drive-over applications.

Borosilicate Glass

Ideal for limited access locations. Not recommended for high traffic pedestrian areas.

Cover Options for Direct Burial

Use recessed cover for installation in soil, grass, pavers and other uneven surfaces where no cover overhang is desired.

Use flush covers for installation in fine finished surfaces such as granite and marble. They can also be used in some suspended applications. The flush cover will conceal gaps between the luminaire and the surrounding surface.

Recessed Cover

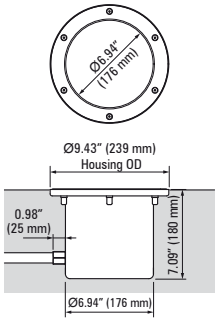
- SS316: Polished
- SS316: Brushed

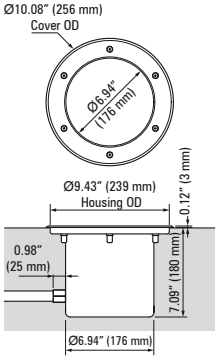
Round Flush Cover

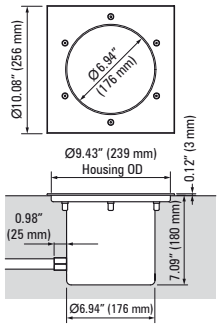
- SS316: Polished
- SS316: Brushed

Square Flush Cover

- SS316: Brushed







Project: Beverly Garden Parks Block 13
HLB Project #: 16089

Date: 22 December, 2016
Submittal: 100% CD/BID SET

Type: F3 Series

Product	Lamp	Lens	Cover	Connection Type	Optical System	Housing Depth	Wire Entry Location	Input Voltage
LS853LED				82		28		

LAMP

Description	Wattage	Color	Code
LED	16 W	White (4300 K typ.)	16W4
		Warm white (3000 K typ.)	16H6
		Blue (470 nm)	16B4
LED	20 W	White (4300 K typ.)	20W4
		Warm white (3000 K typ.)	20H6
		Blue (470 nm)	20B4
		RGB	20M4

OPTICAL SYSTEM

Description	Beam		Code
Adjustable	Narrow	14°	NR[1]
Adjustable	Narrow Medium	25°	NM
Adjustable	Medium	30°	ME[2]
Adjustable	Linear Horizontal	40° x 20°	LH[3]
Adjustable	Linear Vertical	20° x 40°	LV[3]

[1] Not available for RGB.
[2] Recommended for best RGB color mixing.
[3] Refer to beam orientation diagram.

HOUSING DEPTH

Description	Code
7.09" (180 mm)	28

WIRE ENTRY LOCATION

Description	Code
Side	N
Bottom	Q

LENS

Description		Code
OptiClear™	Very high optical purity and load strength	A
GripGlass™	OptiClear™ with slip reduction glazing process	G
Borosilicate Glass	Ideal for limited access locations	X

INPUT VOLTAGE

Description	Code
120-277 V, 50/60 Hz	09[1]
0-10 V Dimmable Driver, 120-277 V, 50/60 Hz	09-DIM[1][2]
12-15 V, 60 Hz or 12-24 V DC	13[1][2][3]
PWM Dimmable Driver, 12 V, 60 Hz or 12-24 V DC	13-DIM[3]

[1] Not available for RGB.
[2] Not available with 16 W module.
[3] Requires appropriate transformer.

COVER

Description	Material	Finish	Code
Recessed Cover	Stainless steel	Polished	B
		Brushed	H
Round Flush Cover	Stainless steel	Polished	D
		Brushed	I
Square Flush Cover	Stainless steel	Brushed	V

Dimmable Wiring Diagram Reference

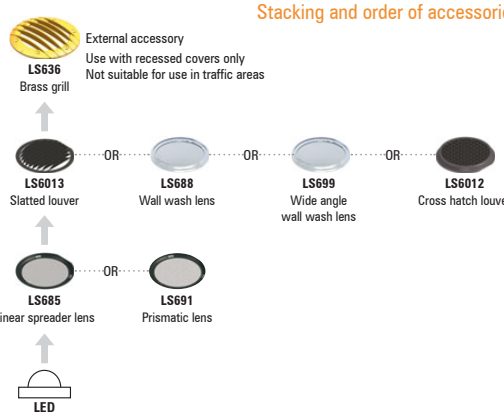
Input Voltage	LED Color	Control Type	Wiring Diagram
09-DIM	Single Color	0-10 V	1
13-DIM	Single Color	PWM	6
13-DIM	RGB	PWM	8,9

CONNECTION TYPE

Description	Code
½" NPT Adapter	82

LS853LED Accessories

Stacking and order of accessories



Other accessory stacking options may be available - consult factory

Project: Beverly Garden Parks Block 13
HLB Project #: 16089

Date: 22 December, 2016
Submittal: 100% CD/BID SET

Type: F3 Series

LIGHTING CONTROL CUT SHEET Note: This document is for information only. Refer to specifications for all catalog numbers, etc.

Photometrics

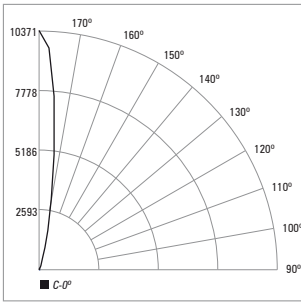
Photometric data is based on test results from a NIST traceable testing lab. IES data is available at www.lumascape.com.
Note: No depreciation factor is applied to the data shown.

LS853LED 4 300 K[1] 14° Beam Angle

Power Input	17 W
Lumens	959
Efficacy	56 lm/W

[1] To approximate warm white data, multiply by 0.84. Refer web site for IES files for all color temperatures.

Polar Candela Distribution



	C 0°	C 15°	C 30°	C 45°	C 60°	C 75°	C 90°
90°	0	0	0	0	0	0	0
100°	0	0	0	0	0	0	0
110°	0	0	0	0	0	0	0
120°	0	0	0	0	0	0	0
130°	2	3	3	4	3	3	2
140°	18	18	18	18	18	17	16
150°	62	63	64	63	61	57	55
160°	322	326	326	319	300	292	290
170°	3080	3084	3070	3039	2984	2938	2912
180°	10371	10371	10371	10371	10371	10371	10371

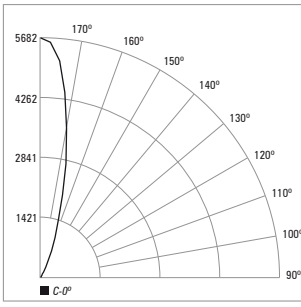
Illuminance at a Distance

ft	Center Beam fc	Beam Ø
5	414.8	1 ft
10	103.7	3 ft
15	46.1	4 ft
25	16.6	7 ft
30	11.5	8 ft
40	6.5	11 ft
50	4.1	13 ft

LS853LED 4 300 K[1] 25° Beam Angle

Power Input	21 W
Lumens	1265
Efficacy	60 lm/W

[1] To approximate warm white data, multiply by 0.84. Refer web site for IES files for all color temperatures.



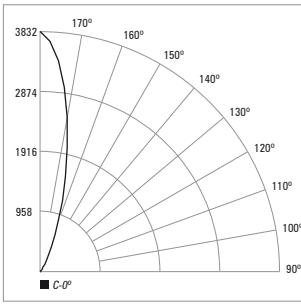
	C 0°	C 15°	C 30°	C 45°	C 60°	C 75°	C 90°
90°	0	0	0	0	0	0	0
100°	0	0	0	0	0	0	0
110°	0	0	0	0	0	0	0
120°	0	0	0	0	0	0	0
130°	7	5	5	4	4	6	7
140°	23	25	26	25	23	21	22
150°	155	148	146	144	145	145	162
160°	1001	987	961	953	961	964	956
170°	3573	3543	3518	3498	3475	3475	3493
180°	5682	5682	5682	5682	5682	5682	5682

ft	Center Beam fc	Beam Ø
5	227.3	2 ft
10	56.8	4 ft
15	25.3	7 ft
25	9.1	11 ft
30	6.3	13 ft
40	3.6	18 ft
50	2.3	22 ft

LS853LED 4 300 K[1] 30° Beam Angle

Power Input	21 W
Lumens	1137
Efficacy	54 lm/W

[1] To approximate warm white data, multiply by 0.84. Refer web site for IES files for all color temperatures.



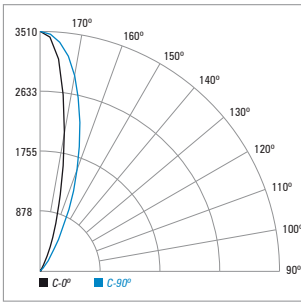
	C 0°	C 15°	C 30°	C 45°	C 60°	C 75°	C 90°
90°	0	0	0	0	0	0	0
100°	0	0	0	0	0	0	0
110°	0	0	0	0	0	0	0
120°	0	0	0	0	0	0	0
130°	12	11	9	7	8	9	11
140°	43	46	50	52	52	48	43
150°	206	204	204	209	210	209	219
160°	881	874	853	849	865	897	923
170°	2495	2463	2439	2435	2452	2489	2554
180°	3832	3832	3832	3832	3832	3832	3832

ft	Center Beam fc	Beam Ø
5	153.3	3 ft
10	38.3	5 ft
15	17	8 ft
25	6.1	13 ft
30	4.3	16 ft
40	2.4	21 ft
50	1.5	27 ft

LS853LED 4 300 K[1] 20° x 40° Beam Angle

Power Input	21 W
Lumens	1126
Efficacy	54 lm/W

[1] To approximate warm white data, multiply by 0.84. Refer web site for IES files for all color temperatures.

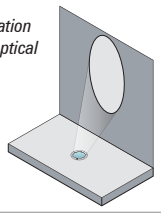


	C 0°	C 15°	C 30°	C 45°	C 60°	C 75°	C 90°
90°	0	0	0	0	0	0	0
100°	0	0	0	0	0	0	0
110°	0	0	0	0	0	0	0
120°	0	0	0	0	0	0	0
130°	10	9	8	8	13	21	28
140°	20	21	26	44	82	132	138
150°	89	101	130	199	325	479	541
160°	565	593	697	888	1149	1477	1582
170°	2073	2118	2252	2460	2714	2862	2905
180°	3510	3510	3510	3510	3510	3510	3510

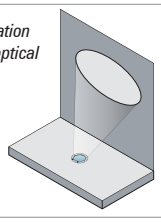
ft	Center Beam fc	Beam W	Beam L
5	140.4	2 ft	4 ft
10	35.1	4 ft	7 ft
15	15.6	5 ft	11 ft
25	5.6	9 ft	18 ft
30	3.9	11 ft	22 ft
40	2.2	14 ft	29 ft
50	1.4	18 ft	36 ft

Beam Orientations

Beam Orientation for the "LV" optical system



Beam Orientation for the "LH" optical system



Project: Beverly Garden Parks
Block 13
HLB Project #: 16089

Date: 22 December, 2016
Submittal: 100% CD/BID SET

Type: F3 Series

LIGHTING CONTROL CUT SHEET Note: This document is for information only. Refer to specifications for all catalog numbers, etc.

Diagram 1 - 0-10 V Dimming for Line Voltage LED Luminaires

Please note: The use of a GFCI may be required. Consult local wiring rules.

0-10V

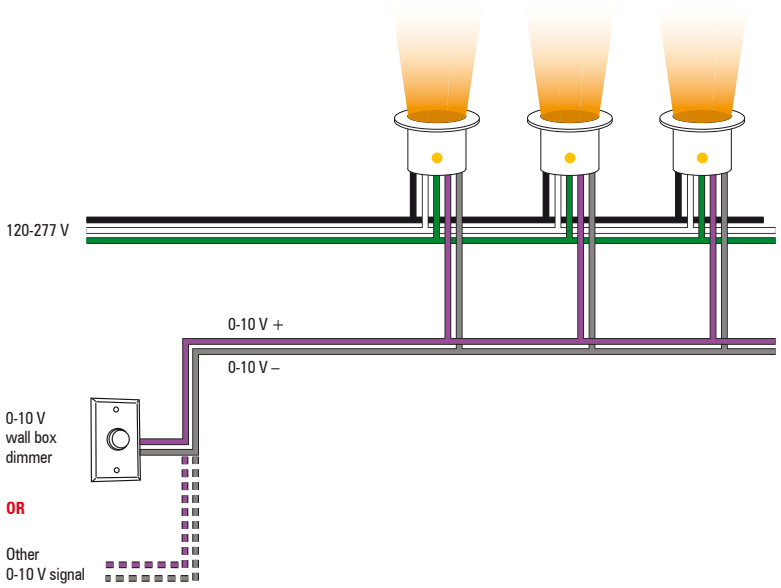
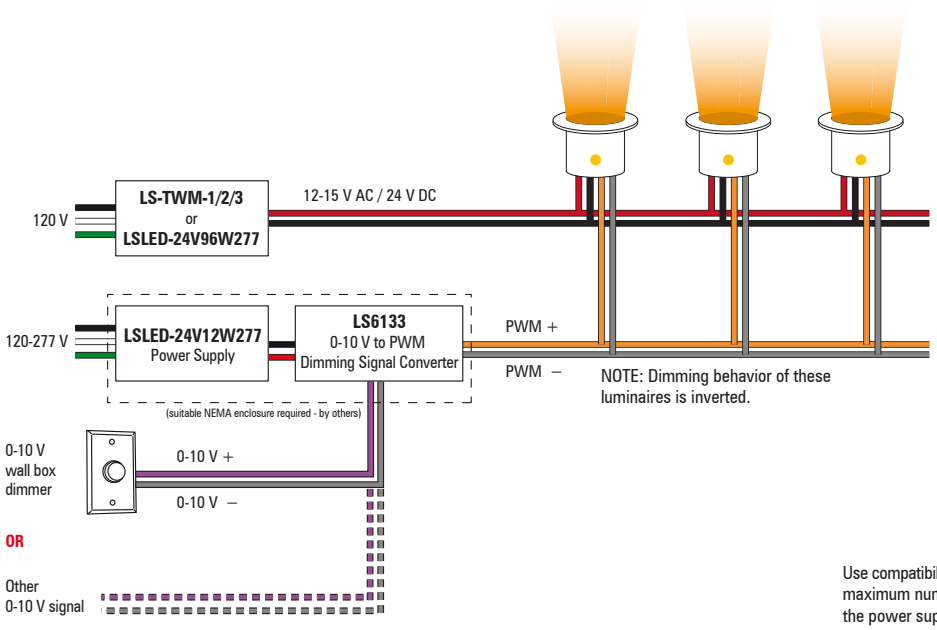


Diagram 6 - 0-10 V Dimming - Low Voltage LED Luminaire on 12-15 V AC or 24 V DC Circuit

PWM DIM



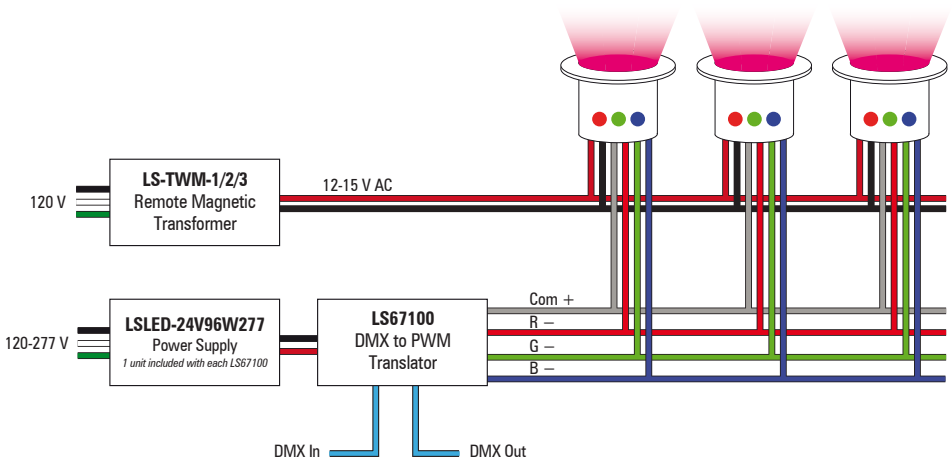
Use compatibility table to determine maximum number of luminaires the power supply can support.

NOTE: The above diagrams are intended to show electrical pathways between luminaires and ancillary devices. These diagrams are not intended to show type or color of cord/wire, wire gauge or approved use of the cord/wire supplied with luminaires.

Consult the luminaire-specific cutsheet or the factory for detailed specifications.

Diagram 8 - RGB via DMX for Low Voltage LED Luminaire on 12-15 V AC Circuit

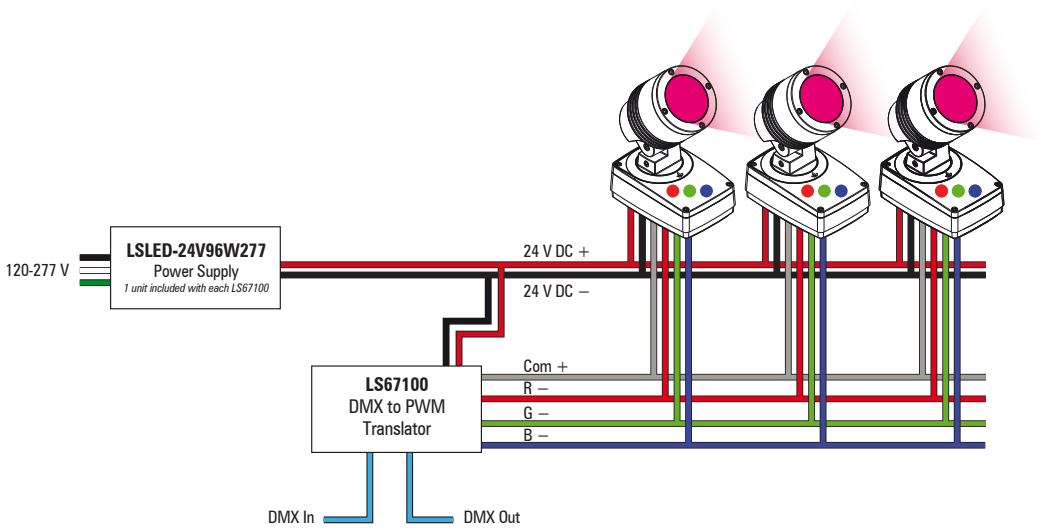
PWM DIM



Use compatibility table to determine maximum number of luminaires the power supply can support.

Diagram 9 - RGB via DMX for Low Voltage LED Luminaire on 24 V DC Circuit

PWM DIM



Use compatibility table to determine maximum number of luminaires the power supply can support.

NOTE: The above diagrams are intended to show electrical pathways between luminaires and ancillary devices. These diagrams are not intended to show type or color of cord/wire, wire gauge or approved use of the cord/wire supplied with luminaires.

Consult the luminaire-specific cutsheet or the factory for detailed specifications.

Transformers and Power Supplies for Low Voltage LED Luminaires

The following list of transformers and power supplies are for use with luminaires specifically described as being compatible with either 12 V AC (wirewound only) transformers or with 12-24 V DC power supplies. Compatibility will be noted in the ordering code of the luminaire concerned, and will typically be referenced by Voltage Code '13' or '13-DIM'. In the case of '13-DIM' additional components may be required. Refer to the applicable wiring diagram/s.

Compatibility with each transformer or power supply is indicated by the value mentioned, representing the maximum number of luminaires that may be powered from each transformer or power supply. Please note, this does not take into consideration voltage drop or ampacity limits of the branch circuit. For assistance, please contact factory.

	Wall Mounted Landscape Lighting Transformers			Wall Mounted Transformers				Class 2 Power Supply	Direct Burial Transformer
	LS-TWM-1-300	**LS-TWM-2-600**	**LS-TWM-3-900**	**LS-TWM-50**	**LS-TWM-100**	**LS-TWM-150**	**LS-TWM-250**	**LSLED-24V96W277**	**LS-TDB1-300**
Input Voltage	120 V, 60 Hz	120 V, 60 Hz	120 V, 60 Hz	120 V, 60 Hz	120 V, 60 Hz	120 V, 60 Hz	120 V, 60 Hz	120-277 V, 50/60 Hz	120 V, 60 Hz
Output Voltage	12/13/14/15 V 60 Hz	12/13/14/15 V 60 Hz	12/13/14/15 V 60 Hz	12 V, 60 Hz	12 V, 60 Hz	12 V, 60 Hz	12 V, 60 Hz	24 V DC	12.5 V, 60 Hz
Wattage	1 x 300 W circuit	2 x 300 W circuits	3 x 300 W circuits	50 W	100 W	150 W	250 W	96 W	300 W
LS853LED, 20 Watt	8	16	24					1	

Transformers for Landscape Lighting Applications

LS-TWM-1-300

Magnetic transformer - wall mounted

Input	120 V
Rating	300 W
Output	12/13/14/15 V
Output Circuits	1
Protection	Electrostatic shield, magnetic breaker
Approvals	UL, CUL
NEMA Rating	3R
Construction	Stainless steel
Dimensions	**H** 17.6" (447 mm) **W** 6.8" (173 mm) **D** 6.19" (157 mm)
Weight	27 lb (12.3 kg)

LS-TWM-2-600

Magnetic transformer - wall mounted

Input	120 V
Rating	600 W
Output	12/13/14/15 V
Output Circuits	2
Protection	Electrostatic shield, magnetic breaker
Approvals	UL, CUL
NEMA Rating	3R
Construction	Stainless steel
Dimensions	**H** 17.6" (447 mm) **W** 6.8" (173 mm) **D** 6.19" (157 mm)
Weight	29 lb (13.2 kg)

LS-TWM-3-900

Magnetic transformer - wall mounted

Input	120 V
Rating	900 W
Output	12/13/14/15 V
Output Circuits	3
Protection	Electrostatic shield, magnetic breaker
Approvals	UL, CUL
NEMA Rating	3R
Construction	Stainless steel
Dimensions	**H** 18.6" (472 mm) **W** 7.8" (198 mm) **D** 6.19" (157 mm)
Weight	34 lb (15.5 kg)

LS-TDB1-300

Magnetic transformer - direct burial

Input	120 V
Rating	300 W
Output	12.5 V
Output Circuits	1
Protection	Circuit breaker
Approvals	ETL (US and Canada)
NEMA Rating	12
Construction	Reinforced composite
Dimensions	**H** 9" (229 mm) **W** 9" (229 mm) **D** 7" (178 mm)
Weight	8 lb (3.6 kg)

Class 2 LED Power Supplies

LSLED-24V96W277

Electronic DC power supply - wall mounted

Input	120-277 V, 50/60 Hz
Rating	96 W / 4 A
Output	24 V DC
Output Circuits	1
Approvals	CSA, CSA-US
Location	Wet location
Dimensions	**H** 12.32" (313 mm) **W** 2.54" (65 mm) **D** 1.67" (42 mm)
Weight	2 lb (0.9 kg)

LSLED-24V12W277

Electronic DC power supply - NEMA enclosure required (by others)

Input	120-277 V, 50/60 Hz
Rating	12 W / 0.5 A
Output	24 V DC
Output Circuits	1
Approvals	UL, CUL Recognized, Class 2
IP rating	IP66
Location	Wet location
Dimensions	**H** 3.35" (85 mm) **W** 1.42" (36 mm) **D** 0.91" (23 mm)
Weight	0.282 lb (0.1 kg)

Control Related Equipment

LS6133

0-10 V to PWM translator - NEMA enclosure required (by others)

Input	24 V DC		
Rating	96 W max		
Output	4 A max		
Output Circuits	1		
Approvals	UL, CUL Recognized, Class 2		
IP Rating	IP66		
Dimensions	**H** 5.2" (132 mm)	**W** 1.3" (33 mm)	**D** 1" (25 mm)
Weight	0.2 lb (0.1 kg)		

LS67100

DMX to PWM translator - dry location only

Input	24 V DC		
Rating	4 x 60 W max		
Output	4 x 2.5 A max		
Output Circuits	4		
Approvals	UL, CUL		
IP Rating	N/A		
Dimensions	**H** 11.25" (286 mm)	**W** 4.6" (117 mm)	**D** 3.2 (82 mm)
Weight	0.5 lb (0.2 kg)		

FLEX DC 30

Specification Sheet

FLEX DC 30 is a high performance flexible LED fixture suitable for use in coves, under cabinets, in shelves, in-grade, and virtually anywhere a linear fixture is required.

• Standard Color Temperatures: 2400k, 2700k, 3000k, 4100k, and 6000k. Also available in a variety of solid colors as special order.

• FLEX DC is dimmable via 0-10v (sink), line voltage dimming, or DMX.

• IP68 version is UV resistant

ELECTRICAL

Input Voltage	24VDC
Dimming Options	MLV 0-10 Volts DMX Lutron (2-WIRE, 3-WIRE, EcoSystem)
Power Consumption	3.0 Watts per foot
Wire Size	18AWG, 2 wire
Certification	**ETL** - Conforms to UL Std. 2108; Certified to CSA Std. C22.2 No. 9.0 **Title 24** - Applicable CCTs are compliant. Selected FLEXDC models CEC listed. **Closet Rated** - Suitable for installation in the storage area of a clothes closet when used in Optic Arts channel.

PHYSICAL

Field Cuttable	Every 1.97"
Operating Temperature	-40° C (-40°F) to +70°C (+158°F)
Environment	**IP40** - Dry Location **IP68** - Wet Location
Maximum Run Length	32'
Dimensions (WxH)	**IP40 -** 0.31" (8.0mm) x 0.12" (3.2mm) **IP68** - 0.41" (10.4mm) x 0.18" (4.5mm) **IP68 Endcaps -** 0.50" (12.70mm) x 0.31" (7.87mm)

MOUNTING OPTIONS

Mounting Clips	FLEXMNT.SIL.INT, FLEXMNT.SIL.EXT12 (pg. 4)
Double Sided Tape	THERMTAPE10
Channels	Optic Arts Channel (pg. 3-4)

LUMEN OUTPUT

2000K	174.44 lm/ft 62.44 lm/watt
2400K	230.22 lm/ft 76.74 lm/watt
2700K	262.59 lm/ft 87.53 lm/watt
3000K	265.65 lm/ft 88.55 lm/watt
3500K	276.03 lm/ft 92.01 lm/watt
4100K	286.77 lm/ft 95.59 lm/watt
6000K	272.94 lm/ft 90.98 lm/watt

**Stated lumen values have a tolerance of +/- 10%.*

PERFORMANCE

CRI	90+
Lumen Maintenance	50,000 Hours
Binning Tolerance	+/- 100k
Warranty	3 years

PART NUMBER BUILDER

SERIES	IP RATING	COLOR		VOLTAGE	WATTAGE	LENGTH
FLEXDC	**40** = IP40, Dry Location	**20** = 2000k	**60** = 6000k	**24** = 24 VDC	**30** = 3.0	**XX** = Custom Length
	68 = IP68, Wet Location	**24** = 2400k	**R** = Red			
		27 = 2700k	**G** = Green			
		30 = 3000k	**B** = Blue			
		35 = 3500k	**A** = Amber			
		41 = 4100k	**UV** = UV			

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Last Modified: November 22, 2016 11:38 AM

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Project: Beverly Garden Parks
Block 13
HLB Project #: 16089

Date: 22 December, 2016
Submittal: 100% CD/BID SET

Type: F8

LIGHTING CONTROL CUT SHEET Note: This document is for information only. Refer to specifications for all catalog numbers, etc.

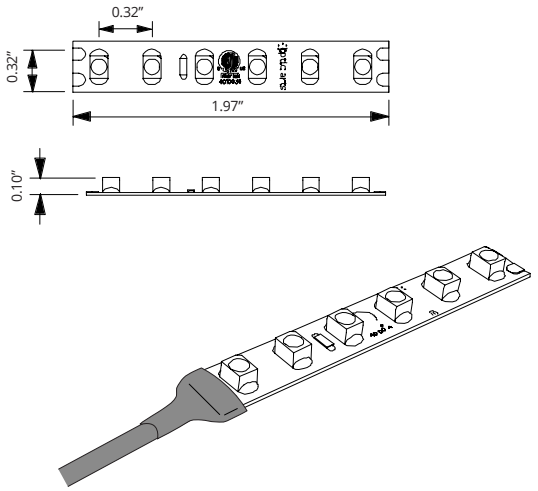
FLEX DC 30 Specification Sheet

DIMENSIONS

Optic Arts cuts all FLEXDC and Channel products to length per customer specifications. Each length of FLEXDC is fitted with a 6' wire lead (custom lengths available upon request) and packaged on a reel in an anti-static bag. Bags are labeled with fixture type, length and location (if applicable). Each piece of channel is labeled with fixture type, length and location (if applicable), and is bundled by fixture type.

- *Due to the nature of the FLEXDC product, specific lengths may not fall exactly on a cutting point. In this case, Optic Arts will always cut to the smaller dimension unless otherwise specified.*
- *Unless otherwise specified, channel is cut 15mm longer than FLEXDC.*
- *Some on-site assembly required. See installation guides for details.*

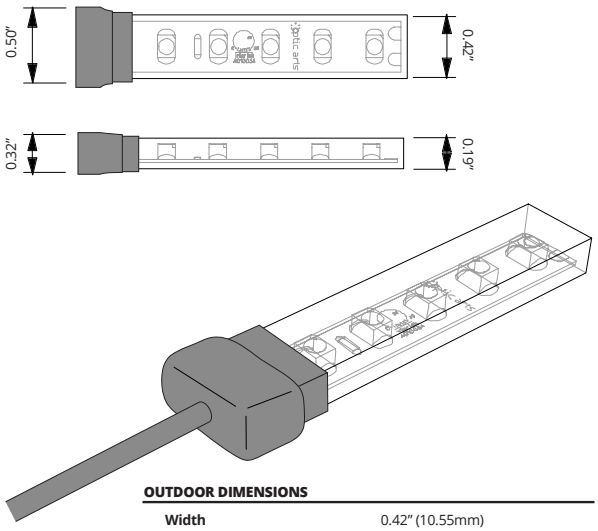
INDOOR FLEX DC 30



INDOOR DIMENSIONS

Width	0.32" (8.00mm)
Height	0.10" (2.52mm)
Cuttable Segment Length	1.97" (50.00mm)
Pitch Length	0.32" (8.00mm)

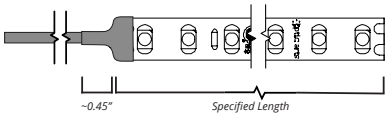
OUTDOOR FLEX DC 30



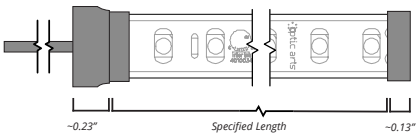
OUTDOOR DIMENSIONS

Width	0.42" (10.55mm)
Height	0.19" (4.88mm)
Width (Endcap)	0.50" (12.70mm)
Height (Endcap)	0.32" (7.94mm)

INDOOR FLEX DC 30



OUTDOOR FLEX DC 30



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Project: Beverly Garden Parks Block 13
HLB Project #: 16089

Date: 22 December, 2016
Submittal: 100% CD/BID SET

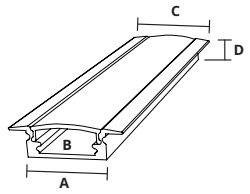
Type: F8

LIGHTING CONTROL CUT SHEET Note: This document is for information only. Refer to specifications for all catalog numbers, etc.

MOUNTING OPTIONS - COMPATIBLE CHANNELS

Not Blended **Blended w/Milky Lens**

CHS-R-1208



Dimensions:
A 0.67" (17.0mm)
B 0.48" (12.2mm)
C 0.99" (25.3mm)
D 0.31" (8.5mm)

Material: Anodized Aluminum

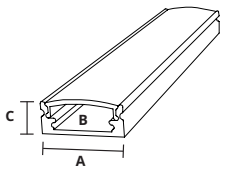
Description: Slim and shallow recessed channel.

Length: 2 meter

Lens Types:
Clear CHS-12mm-CC
Frosted CHS-12mm-CF
Milky CHS-12mm-CM

Accessories:
Endcap CHS-R-1208-EC
End Cap w/hole CHS-R-1208-ECH

CHS-S-1208



Dimensions:
A 0.67" (17.0mm)
B 0.48" (12.2mm)
C 0.31" (8.5mm)

Material: Anodized Aluminum

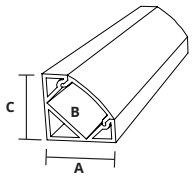
Description: Slim and shallow surface channel.

Length: 2 meter

Lens Types:
Clear CHS-12mm-CC
Frosted CHS-12mm-CF
Milky CHS-12mm-CM
Grazer CHS-12mm-CG

Accessories:
Endcap CHS-S-1208-EC
End Cap w/hole CHS-S-1208-ECH
Mounting Clip CHS-S-1208-MC

CHS-C-1919



Dimensions:
A 0.72" (18.5mm)
B 0.48" (12.2mm)
C 0.72" (18.5mm)

Material: Anodized Aluminum

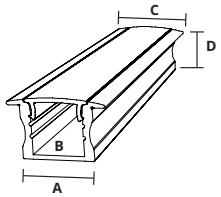
Description: Slim corner mount channel.

Length: 2 meter

Lens Types:
Clear CHS-12mm-CC
Frosted CHS-12mm-CF
Milky CHS-12mm-CM

Accessories:
Endcap CHS-C-1919-EC
End Cap w/hole CHS-C-1919-ECH
Mounting Clip CHS-C-1919-MC

CHS-R-1715



Dimensions:
A 0.68" (17.2mm)
B 0.48" (12.2mm)
C 0.99" (25.3mm)
D 0.61" (15.56mm)

Material: Anodized Aluminum

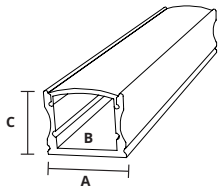
Description: Slim and deep recessed channel. Eliminates visible LED nodes when used with FLEXDC 3.0 and milk lens.

Length: 2 meter

Lens Types:
Clear CHS-12mm-CC
Frosted CHS-12mm-CF
Milky CHS-12mm-CM
Grazer CHS-12mm-CG

Accessories:
Endcap CHS-R-1715-EC
End Cap w/hole CHS-R-1715-ECH

CHS-S-1715



Dimensions:
A 0.68" (17.2mm)
B 0.48" (12.2mm)
C 0.61" (15.56mm)

Material: Anodized Aluminum

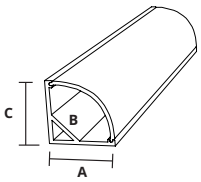
Description: Slim and deep surface mounted channel. Eliminates visible LED nodes when used with FLEXDC 3.0 and milky lens.

Length: 2 meter

Lens Types:
Clear CHS-12mm-CC
Frosted CHS-12mm-CF
Milky CHS-12mm-CM
Grazer CHS-12mm-CG

Accessories:
Endcap CHS-S-1715-EC
End Cap w/hole CHS-S-1715-ECH
Mounting Clip CHS-S-1715-MC

CHS-C-1616



Dimensions:
A 0.76" (16.0mm)
B 0.39" (10.0mm)
C 0.76" (16.0mm)

Material: Anodized Aluminum

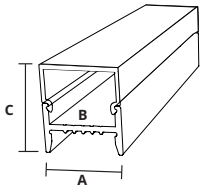
Description: Slim corner mount channel with rounded lens.

Length: 2 meter

Lens Types:
Frosted CHS-C-1616-CF
Milky CHS-C-1616-CM

Accessories:
Endcap CHS-C-1616-EC
End Cap w/hole CHS-C-1616-ECH
Mounting Clip CHS-C-1616-MC

CHS-S-1922S



Dimensions:
A 0.76" (19.5mm)
B 0.649" (16.5mm)
C 0.85" (21.8mm)

Material: Anondized Aluminum

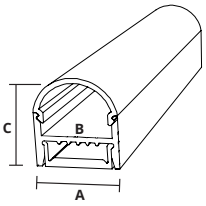
Description: Slim surface mounted channel with square wrap around lens. Mounting slip is fully concealed within fixture base.

Length: 2 meter

Lens Types:
Milky CHW-S-1922S-CM

Accessories:
Endcap CHS-S-1922S-EC
Endcap w/hole CHS-S-1922S-ECH
Mounting Clip CHS-S-1922S-MC

CHS-S-1922R



Dimensions:
A 0.76" (19.5mm)
B 0.649" (16.5mm)
C 0.85" (21.8mm)

Material: Anondized Aluminum

Description: Slim surface mounted channel with rounded wrap around lens. Mounting slip is fully concealed within fixture base.

Length: 2 meter

Lens Types:
Milky CHW-S-1922R-CM

Accessories:
Endcap CHS-S-1922R-EC
Endcap w/hole CHS-S-1922R-ECH
Mounting Clip CHS-S-1922R-MC

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Date: 22 December, 2016
Submittal: 100% CD/BID SET

Type: F8

LIGHTING CONTROL CUT SHEET Note: This document is for information only. Refer to specifications for all catalog numbers, etc.

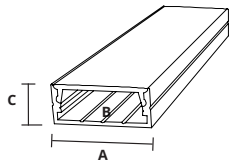
FLEX DC 30

Specification Sheet

***MOUNTING OPTIONS** - COMPATIBLE CHANNELS*

Not Blended Blended w/Milky Lens

CHW-S-2010



Dimensions:
A 0.92" (23.5mm)
B 0.78" (20.0mm)
C 0.39" (10.0mm)

Material: Anodized Aluminum

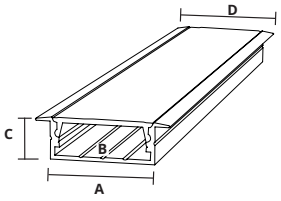
Description: Low profile surface mounted channel.

Length: 2 meter

Lens Types:
Clear CHW-S-2010-CC
Frosted CHW-S-2010-CF
Milky CHW-S-2010-CM

Accessories:
Endcap CHW-S-2010-EC
End Cap w/hole CHW-S-2010-ECH
Mounting Clip CHW-S-2010-MC

CHW-R-2010



Dimensions:
A 0.92" (23.50mm)
B 0.78" (20.00mm)
C 0.39" (10.00mm)
D 1.19" (30.24mm)

Material: Anodized Aluminum

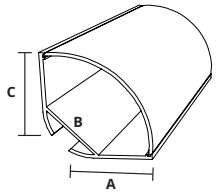
Description: Recessed wide-profile channel.

Length: 2 meter

Lens Types:
Clear CHW-R-2010-CC
Frosted CHW-R-2010-CF
Milky CHW-R-2010-CM

Accessories:
Endcap CHW-R-2010-EC
End Cap w/hole CHW-R-2010-ECH

CHW-C-3030



Dimensions:
A 1.18" (30.0mm)
B 0.78" (20.2mm)
C 1.18" (30.0mm)

Material: Anondized Aluminum

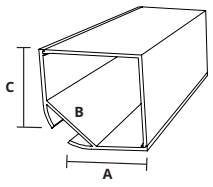
Description: 45 degree channel with rounded lens.

Length: 2 meter

Lens Types:
Clear CHW-C-3030-CC
Frosted CHW-C-3030-CF
Milky CHW-C-3030-CM

Accessories:
Endcap CHW-C-3030-EC
Endcap w/hole CHW-C-3030-ECH
Mounting Clip CHW-C-3030-MC

CHW-C-3030S



Dimensions:
A 1.18" (30.0mm)
B 0.78" (20.2mm)
C 1.18" (30.0mm)

Material: Anondized Aluminum

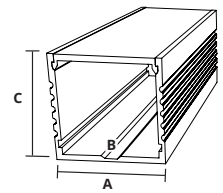
Description: 45 degree channel with square lens.

Length: 2 meter

Lens Types:
Clear CHW-C-3030S-CC
Frosted CHW-C-3030S-CF
Milky CHW-C-3030S-CM

Accessories:
Endcap CHW-C-3030S-EC
Endcap w/hole CHW-C-3030S-ECH
Mounting Clip CHW-C-3030S-MC

CHW-S-3535



Dimensions:
A 1.37" (35.0mm)
B 1.22" (31.0mm)
C 1.37" (35.0mm)

Material: Anondized Aluminum

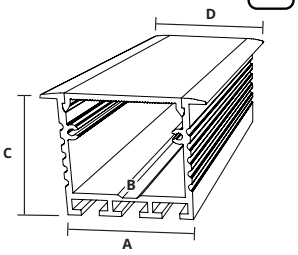
Description: Wide and deep surface mounted channel. Eliminates visible LED nodes for most FLEXDC products when used with a milky lens

Length: 2 meter

Lens Types:
Clear CHW-S-3535-CC
Frosted CHW-S-3535-CF
Milky CHW-S-3535-CM

Accessories:
Endcap CHW-S-3535-EC
Endcap w/hole CHW-S-3535-ECH

CHW-R-4435



Dimensions:
A 1.37" (35.0mm)
B 1.22" (31.0mm)
C 1.37" (35.0mm)
D 1.74" (44.2mm)

Material: Anondized Aluminum

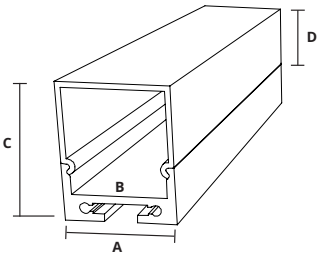
Description: Wide and deep recessed channel. Eliminates visible LED nodes for most FLEXDC products when used with a milky lens. Can be securely and conveniently mounted with CHW-R-3535-SC spring clip.

Length: 2 meter

Lens Types:
Milky CHW-R-3535-CM

Accessories:
Endcap CHW-R-3535-EC
Endcap w/hole CHW-R-3535-ECH
Spring Clip CHW-R-3535-SC

CHW-SH-2027



Dimensions:
A 0.79" (20.3mm)
B 0.65" (16.7mm)
C 1.60" (27.0mm)
D 0.76" (19.5mm)

Material: Anondized Aluminum

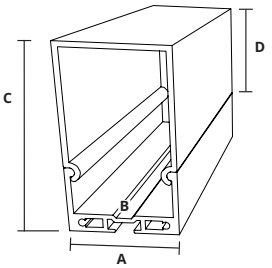
Description: Small surfaced mounted or hanging channel with wrap around lens.

Length: 2 meter

Lens Types:
Clear CHW-SH-2027-CC
Frosted CHW-SH-2027-CF
Milky CHW-SH-2027-CM

Accessories:
Endcap CHW-SH-2027-EC
End Cap w/hole CHW-SH-2027-ECH
Hanging Hardware CHW-SH-2027-HHK

CHW-SH-3561



Dimensions:
A 1.37" (35.0mm)
B 1.23" (31.4mm)
C 2.42" (61.7mm)
D 1.57" (39.9mm)

Material: Anondized Aluminum

Description: Large surfaced mounted or hanging channel with wrap around lens.

Length: 2 meter

Lens Types:
Milky CHW-SH-3561-CM

Accessories:
Endcap CHW-SH-3561-EC
Endcap w/hole CHW-SH-3561-ECH
Hanging Hardware CHW-SH-3561-HHK

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Type: F8

LIGHTING CONTROL CUT SHEET Note: This document is for information only. Refer to specifications for all catalog numbers, etc.

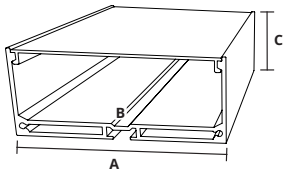
FLEX DC 30

Specification Sheet

***MOUNTING OPTIONS** - COMPATIBLE CHANNELS*

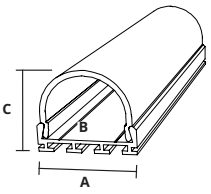
Not Blended Blended w/Milky Lens

CHW-SH-7532



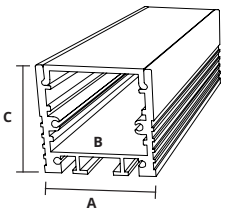
Dimensions:	
A	2.95" (75.0mm)
B	2.51" (64.0mm)
C	1.25" (32.0mm)
Material:	Anondized Aluminum
Description:	Wide surface mounted or hanging channel.
Length:	2 meter
Lens Types:	
Milky	CHW-SH-7532-CM
Accessories:	
Endcap	CHW-SH-7532-EC
Endcap w/hole	CHW-SH-7532-ECH
Hanging Hardware	CHW-SH-7532-HHK

CHW-S-2623



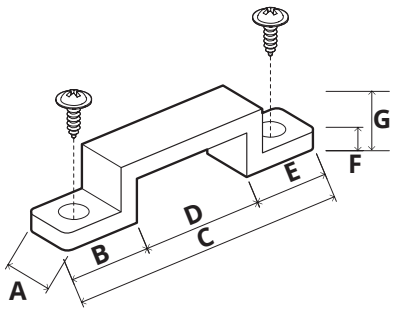
Dimensions:	
A	1.03" (26.2mm)
B	0.80" (20.35mm)
C	0.89" (22.76mm)
Material:	Anondized Aluminum
Description:	Surface mounted channel with wrap around lens.
Length:	2 meter
Lens Types:	
Milky	CHW-S-2623-CM
Accessories:	
Endcap	CHW-S-2623-EC
Endcap w/hole	CHW-S-2623-ECH

CHW-SH-3030



Dimensions:	
A	1.18" (30.0mm)
B	1.01" (25.6mm)
C	1.18" (30.0mm)
Material:	Anondized Aluminum
Description:	Surface mounted or hanging channel.
Length:	2 meter
Lens Types:	
Milky	CHW-SH-3030-CM
Accessories:	
Endcap	CHW-SH-3030-EC
Endcap w/hole	CHW-SH-3030-ECH
Hanging Hardware	CHW-SH-3030-HHK

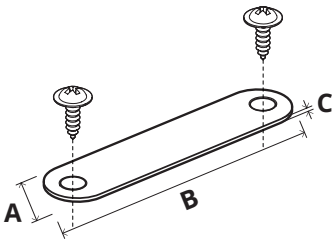
MOUNTING OPTIONS - MOUNTING CLIPS



OUTDOOR MOUNTING CLIP

FLEXMNT.SIL.EXT12

A	0.24" (6.00mm)
B	0.35" (9.00mm)
C	1.24" (28.00mm)
D	0.55" (14.00mm)
E	0.35" (9.00mm)
F	0.08" (2.00mm)
G	0.28" (7.00mm)



INDOOR MOUNTING CLIP

FLEXMNT.SIL.INT

A	0.24" (6.20mm)
B	1.08" (27.50mm)
C	0.05" (1.30mm)

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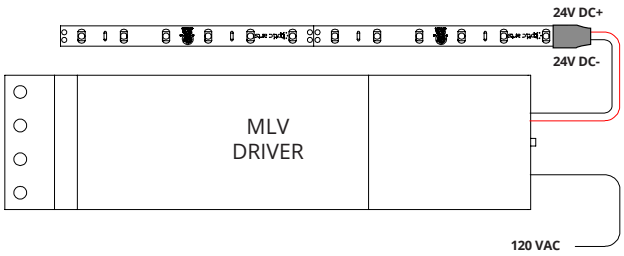
COMPATIBLE DRIVERS



MLV

PART	DESCRIPTION
ML10S24VDC	10W 120VAC DIMMABLE DRIVER
ML20S24VDC	20W 120VAC DIMMABLE DRIVER
ML35S24VDC	35W 120VAC DIMMABLE DRIVER
ML35S24VDC-277	35W 277VAC DIMMABLE DRIVER
ML40S24VDC	40W 120VAC DIMMABLE DRIVER
ML50S24VDC	50W 120VAC DIMMABLE DRIVER
ML50S24VDC-277	50W 277VAC DIMMABLE DRIVER
ML60S24VDC	60W 120VAC DIMMABLE DRIVER
ML75S24VDC	75W 120VAC DIMMABLE DRIVER
ML75S24VDC-277	75W 277VAC DIMMABLE DRIVER
ML96S24VDC	96W 120VAC DIMMABLE DRIVER
ML96S24VDC-277	96W 120VAC DIMMABLE DRIVER
EM2-200S24DC	200W 120VAC DIMMABLE DRIVER, 2 96W CIRCUITS
EM3-300S24DC	300W 120VAC DIMMABLE DRIVER, 3 96W CIRCUITS
EM2-200S24DC-277	200W 120VAC DIMMABLE DRIVER, 2 96W CIRCUITS
EM3-300S24DC-277	288W 120VAC DIMMABLE DRIVER, 3 96W CIRCUITS

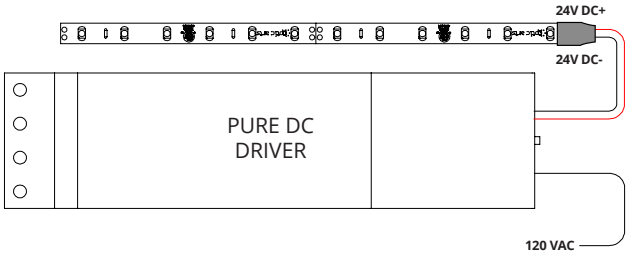
DIMENSIONS

10W-50W	**H** 2.11"; **W** 7.38"; **D** 1.60"
60W-96W	**H** 3.93"; **W** 8.13"; **D** 1.59"
200-300W	**H** 5.69"; **W** 10.29"; **D** 3.13"

DIMMING PERFORMANCE

MLV DRIVER	Dims to 20% on most MLV dimmers

NOTE: Must be loaded between 75%-100% of rated load to maintain FLEX DC warranty



PURE DC MLV

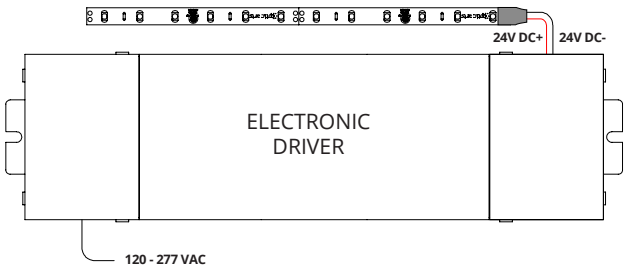
PART	DESCRIPTION
481-24DCR	48W 120VAC JUSTIN MLV DIMMABLE DRIVER
481-24DCR-277	48W 277VAC JUSTIN MLV DIMMABLE DRIVER
961-24DCR	96W 120VAC JUSTIN MLV DIMMABLE DRIVER
961-24DCR-277	96W 277VAC JUSTIN MLV DIMMABLE DRIVER

DIMENSIONS

48W/96W	**H** 3.37"; **W** 11.25"; **D** 3.25"

DIMMING PERFORMANCE

PURE DC DRIVER	Dims to 0.1% on most MLV dimmers



ELECTRONIC DRIVER - NON-DIM

PART	DESCRIPTION
GG100E-24-UNV	ELECTRONIC DRIVER

DIMENSIONS

48W/96W	**H** 3.00"; **W** 11.46"; **D** 1.30"

DIMMING PERFORMANCE

PURE DC DRIVER	Non-Dim

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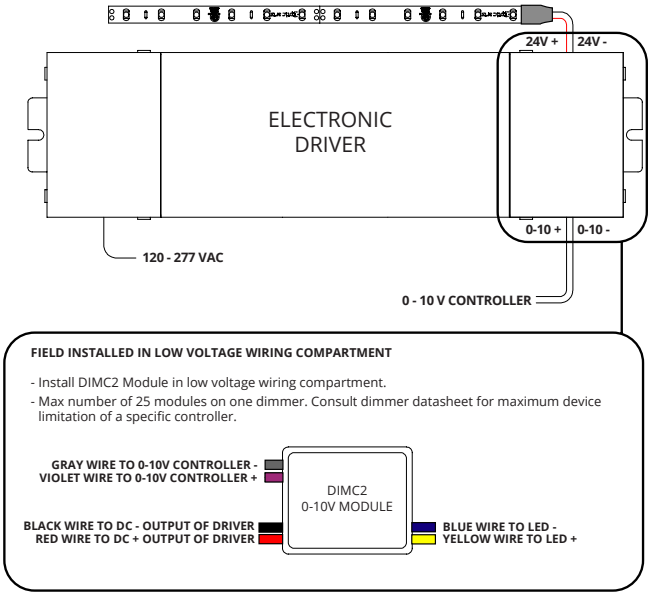
COMPATIBLE DRIVERS



ELECTRONIC DRIVER W/0-10V MODULE

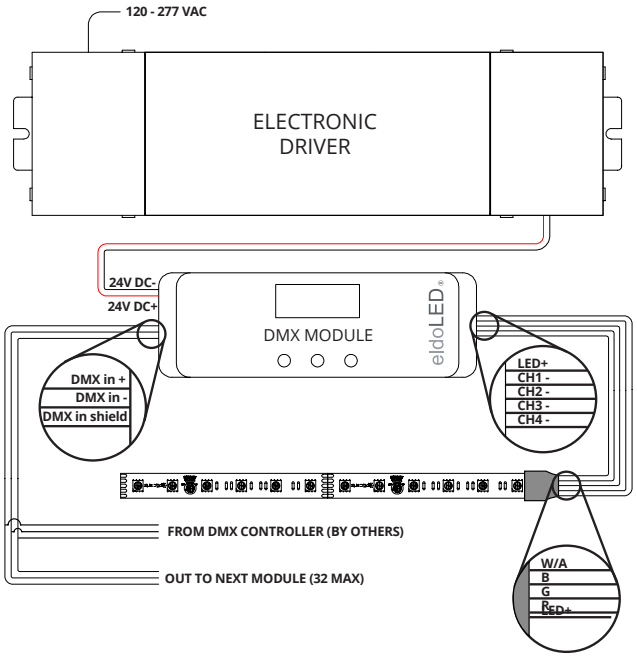
PART	DESCRIPTION
GG100E-24-UNV-010V	96W 120-277VAC ELECTRONIC DRIVER WITH 0-10V DIMMING MODULE (SINK)

DIMENSIONS

96W	**H** 3.00"; **W** 11.46"; **D** 1.30"

DIMMING PERFORMANCE

ELECTRONIC DRIVER - 0-10V	Dims to 10% on most 0-10V dimmers



ELECTRONIC DRIVER W/DMX MODULE

PART	DESCRIPTION
GG100E-24-UNV-DMX	96W 120-277VAC ELECTRONIC DRIVER WITH eldoLED DMX DIMMING MODULE

DIMENSIONS

96W	**H** 3.00"; **W** 11.46"; **D** 1.30"
DMX MODULE	**H** 1.97"; **W** 6.02"; **D** 0.91"

**Must be installed in UL box (by others)*

DIMMING PERFORMANCE

ELECTRONIC DRIVER - DMX MODULE	Dims to 0.1% on most DMX systems

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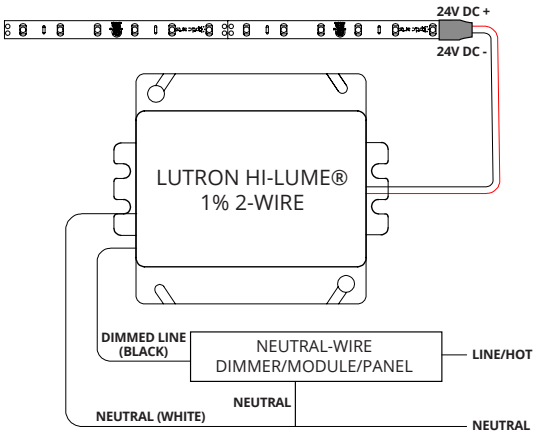
FLEX DC 30

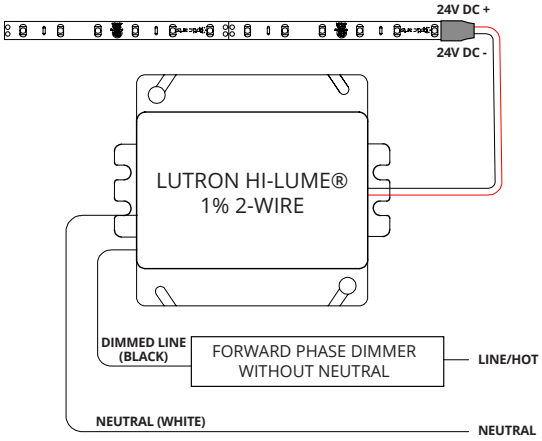
Specification Sheet

COMPATIBLE DRIVERS

DIMMER WITH NEUTRAL



DIMMER WITHOUT NEUTRAL



LUTRON HI-LUME® 1% 2-WIRE:
2-WIRE CONTROL FORWARD PHASE

Optic Arts is a Lutron OEM Advantage Partner

PART	DESCRIPTION
LTEA4U1UKL-CV240	5-40W, 120VAC, 2-WIRE FORWARD PHASE DRIVER

DIMENSIONS	
HI-LUME® 1% 2-WIRE	**H** 4.00"; **W** 4.89"; **D** 2.62"

DIMMING PERFORMANCE	
LUTRON HI-LUME® 1% 2-WIRE	Dims to 1% with compatible Lutron controls

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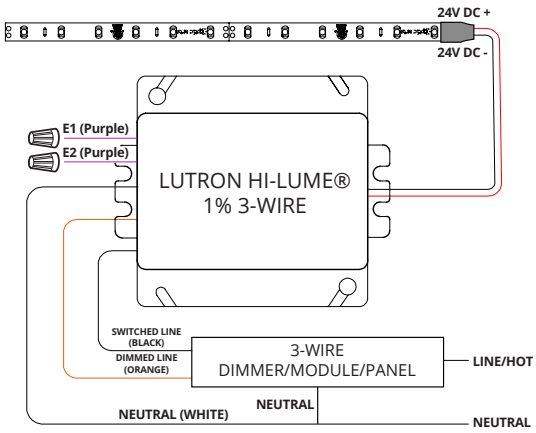
FLEX DC 30

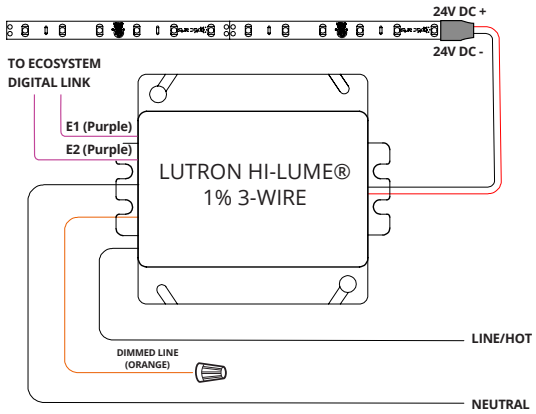
Specification Sheet

COMPATIBLE DRIVERS

3-WIRE



ECOSYSTEM



LUTRON HI-LUME® 1%:
3-WIRE/ECOSYSTEM

Optic Arts is a Lutron OEM Advantage Partner

PART	DESCRIPTION
L3DA4U1UKL-CV240	5-40W, 120-277VAC, 3-WIRE/ECOSYSTEM DRIVER

DIMENSIONS	
HI-LUME® 1%	**H** 4.00"; **W** 4.89"; **D** 2.62"

DIMMING PERFORMANCE	
LUTRON HI-LUME® 1% 3-WIRE/ECOSYSTEM	Dims to 1% with compatible Lutron controls

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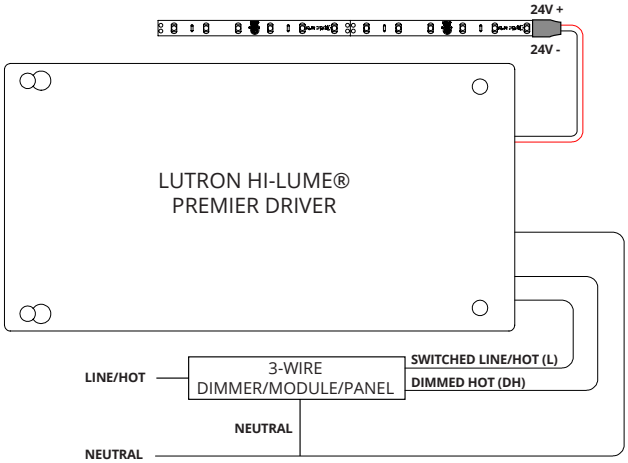
FLEX DC 30

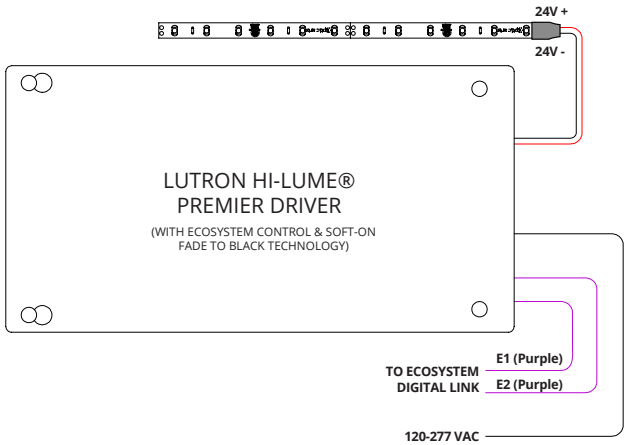
Specification Sheet

COMPATIBLE DRIVERS

3-WIRE



ECOSYSTEM



LUTRON HI-LUME® PREMIER:
3-WIRE/ECOSYSTEM

Optic Arts is a Lutron OEM Advantage Partner

PART	DESCRIPTION
L3D0-96W24V-U	25-96W, 120-277VAC, 3-WIRE/ECOSYSTEM DRIVER

DIMENSIONS

HI-LUME® PREMIER	**H** 5.5"; **W** 10.5"; **D** 2.0"

DIMMING PERFORMANCE

LUTRON HI-LUME® PREMIER	Dims to 0.1% with compatible Lutron controls

NOTE: Lutron soft-on, fade to black technology available with Ecosystem Digital Control only.

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SECTION 265600

EXTERIOR LIGHTING

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. Exterior luminaires with lamps and ballasts.
2. Luminaire-mounted photoelectric relays.
3. Poles and accessories.
4. Luminaire lowering devices.

B. Related Sections:
1. Section 260519 " Low Voltage Electrical Power Conductors and Cables".

1.3 DEFINITIONS

A. AASHTO: American Association of State Highway and Transportation Officials

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. LED: Light Emitting Diode.

E. IESNA: Illuminating Engineering Society of North America

F. LER: Luminaire efficacy rating.

G. Luminaire: Complete lighting fixture, including ballast housing if provided.

H. Pole: Luminaire support structure, including tower used for large area illumination.

I. Standard: Same definition as "Pole" above.

1.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.

B. Live Load: Single load of 500 lbf, distributed as stated in AASHTO LTS-4-M.

C. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4-M Ice Load Map.

D. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.
   1. Basic wind speed for calculating wind load for poles 50 feet high or less is 100 mph
      a. Wind Importance Factor: 1.0
      b. Minimum Design Life: 25 years
      c. Velocity Conversion Factors: 1.0.

1.5 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation indicated on Contract Documents. Include data on features, accessories, finishes, and the following:
   1. Manufacturer's dimensioned scale drawings showing in complete detail the fabrication of all lighting fixtures including overall dimensions, finishes, metal thickness, glass thickness, type, fabrication methods, support method, ballasts, transformers, sockets, type of shielding, reflectors, trims, hinges, gaskets, provisions for relamping and all other information to show compliance with contract documents.
   2. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
   3. Details of attaching luminaires and accessories.
   4. Details of installation and construction.
   5. Luminaire materials.
   6. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories. Photometric data shall be developed according to methods of IESNA.
      a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
      b. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
   7. Ballasts, including energy-efficiency data.
   8. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
   9. Materials, dimensions, and finishes of poles.
   10. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
   11. Anchor bolts for poles.
   12. Manufactured pole foundations.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
   3. Design calculations, certified by a qualified professional engineer, indicating strength of screw foundations and soil conditions on which they are based.
   4. Wiring Diagrams: For power, signal, and control wiring.
   5. For outdoor pathway, parking and roadway luminaires submit photometric calculations with point by point summary layout plan. isocandela charts, coefficients of utilization and IES roadway distribution classification.

6. Maintenance and operating instructions including tools required, types of cleaners to be used, replacement parts and final as-built shop drawings and name of the project, Architect and Lighting Consultant.

C. Fixtures under the contract shall be identical with the approved sample fixture. No fixture used as a sample shall be allowed to be installed on the project.

D. In the event the submission are disapproved, the fixtures shall be returned to the contractor to immediately make a new submission of the fixture in compliance with the contract documents at no additional cost to the owner.

E. All charges for these shipments shall be prepaid by the contractor.

1.6 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations by a professional engineer.

B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

C. Field quality-control reports.

D. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For [luminaires][and poles] [luminaire lowering devices] to include in emergency, operation, and maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Glass and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least two (2) of each type.
2. Drivers: One for every 100 of each type and rating installed. Furnish at least two (2) of each type.

1.9 QUALITY ASSURANCE

A. Materials and appurtenances as well as workmanship provided under this section shall conform to highest commercial standards, and as specified and as indicated on drawings. Fixture parts and components not specifically identified or indicates shall be made of materials most appropriate to their use or function and as such resistant to corrosion and thermal and mechanical stresses encountered in the normal application and function of the fixtures.

B. All fixtures shall be manufactured to a consistent level of quality. Size, color and component shall be identical for all fixtures of same types.

C. All fixtures and components shall be made in accordance with applicable codes and standards such as NEC, CEC and bear the label of independent laboratories such as Underwriters Laboratories (UL) or Factory Mutual (FM).

D. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

E. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.

F. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Comply with IEEE C2, "National Electrical Safety Code."

H. Comply with NFPA 70.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Handle wood poles so they will not be damaged. Do not use pointed tools that can indent pole surface more than 1/4 inch deep. Do not apply tools to section of pole to be installed below ground line.

D. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.

E. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
   1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
   2. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings and/or specifications.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Luminaires shall comply with UL 1598 and be UL listed and labeled for installation in wet locations.

B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 83 percent.
   3. Diffusing Specular Surfaces: 75 percent.

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind

welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
   a. Color: As selected from manufacturer's standard catalog of colors.
   b. Color: Match Architect's sample of custom color.
   c. Color: As selected by Architect from manufacturer's full range.

N. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
   2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
   3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
   4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
      a. Color: Custom color.

O. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
   1. Label shall include the following lamp and ballast characteristics:
      a. "USES ONLY" and include specific lamp type.
      b. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
      c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
      d. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.
      e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
      f. CCT and CRI for all luminaires.

2.3 DRIVERS FOR LED FIXTURES

A. Electronic Driver for LED Fixtures: Comply with UL 1310 Class 2 requirements for dry and damp locations. Include the following features unless otherwise indicated:
   1. Rated for 50,000 hours of life, unless otherwise noted.
   2. Sound Rating: Class A.
   3. Total Harmonic Distortion Rating: 15 percent or less.
   4. Current Crest Factor: 1.5 or less.
   5. 0-10V Dimming Standard (Step Dimming does not qualify)

2.4 LED FIXTURES

A. Except as otherwise indicated, provide LED luminaires, of types and sizes indicated on fixture schedules.

B. Include the following features unless otherwise indicated:
   1. Each Luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).
   2. Each luminaire shall be rated for a minimum operational life of 50,000 hours utilizing a minimum ambient temperature of (25°C).
   3. Light Emitting Diodes tested under LM-80 Standards for a minimum of 12,000 hours.
   4. Color Rendering Index (CRI) of 82 at a minimum.
   5. Color temperature 4000K, unless otherwise indicated.
   6. Rated lumen maintenance at 70% lumen output for 50,000 hours, unless otherwise indicated.
   7. Fixture efficacy of 60 Lumens/Watt, minimum.
   8. 5 year luminaire warranty, minimum.
   9. Photometry must comply with IESNA LM-79.
   10. The individual LEDs shall be constructed such that a catastrophic loss of the failure of one LED will not result in the loss of the entire luminaire.
   11. Luminaire shall be constructed such that LED modules may be replaced or repaired without the replacement of the whole fixture.

C. Technical Requirements
   1. Luminaire shall have a minimum efficacy of 60 lumens per watt. The luminaire shall not consume power in the off state.
   2. Operation Voltage: The luminaire shall operate from a 50 HZ to 60 HZ AC line over a voltage ranging from 120 VAC to 277 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
   3. Power Factor: The luminaire shall have a power factor of 0.9 or greater.
   4. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 15 percent.
   5. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.

D. Thermal Management
   1. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
   2. The LED manufacturer’s maximum thermal pad temperature for the expected life shall not be exceeded.
   3. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
   4. The luminaire shall have a minimum heat sink surface such that LED manufacturer’s maximum junction temperature is not exceeded at maximum rated ambient temperature.

2.5 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.
   1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
   2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
   1. Materials: Shall not cause galvanic action at contact points.
   2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
   3. Anchor-Bolt Template: Plywood or steel.

D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with gasketed cover secured by stainless-steel captive screws.

E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

F. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.

G. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4-M.

2.6 STEEL POLES

A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig; one-piece construction up to 40 feet in height with access handhole in pole wall.
   1. Shape: Square, straight.
   2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

B. Steel Mast Arms: Single-arm type, continuously welded to pole attachment plate. Material and finish same as pole.

C. Brackets for Luminaires: Detachable, cantilever, without underbrace.
   1. Adapter fitting welded to pole, allowing the bracket to be bolted to the pole mounted adapter, then bolted together with galvanized-steel bolts.
   2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
   3. Match pole material and finish.

D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

E. Steps: Fixed steel, with nonslip treads, positioned for 15-inch vertical spacing, alternating on opposite sides of pole; first step at elevation 10 feet above finished grade.

F. Intermediate Handhole and Cable Support: Weathertight, 3-by-5-inch handhole located at midpoint of pole with cover for access to internal welded attachment lug for electric cable support grip.

G. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

H. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.

I. Platform for Lamp and Ballast Servicing: Factory fabricated of steel with finish matching that of pole.

J. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.

K. Galvanized Finish: After fabrication, hot-dip galvanize complying with ASTM A 123/A 123M.

L. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."
2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
a. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:
1. Fire Hydrants and Storm Drainage Piping: 60 inches.
2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet
3. Trees: Per landscape architect direction.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
3. Install base covers unless otherwise indicated.
4. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
1. Dig holes large enough to permit use of tampers in the full depth of hole.

2. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.

F. Embedded Poles with Concrete Backfill: Set poles in augered holes to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
1. Make holes 6 inches in diameter larger than pole diameter.
2. Fill augered hole around pole with air-entrained concrete having a minimum compressive strength of 3000 psi at 28 days, and finish in a dome above finished grade.
3. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through concrete dome. Arrange to drain condensation from interior of pole.
4. Cure concrete a minimum of 72 hours before performing work on pole.

G. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch- wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with [pea gravel] <Insert material> to a level 1 inch below top of concrete slab.

H. Raise and set poles using web fabric slings (not chain or cable).

3.2 BOLLARD LUMINAIRE INSTALLATION

A. Align units for optimum directional alignment of light distribution.

B. Install on concrete base with top 4 inches above finished grade or surface at bollard location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.3 INSTALLATION OF INDIVIDUAL GROUND-MOUNTING LUMINAIRES

A. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 GROUNDING

A. Ground metal poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."
1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground nonmetallic poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."
   1. Install grounding electrode for each pole.
   2. Install grounding conductor and conductor protector.
   3. Ground metallic components of pole accessories and foundations.

3.6 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
   1. Verify operation of photoelectric controls.

C. Illumination Tests:
   1. Measure light intensities at night. Tests shall be witnessed by Architect and/or Owner's representative. Provide two (2) weeks advance notice. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
      a. IESNA LM-72, "Directional Positioning of Photometric Data."

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaire lowering devices.

END OF SECTION 265600

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 SECTION INCLUDES

A. Clearing of site.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Division 31 Section "Grading".

B. Division 31 Section "Excavation and Fill for Utilities".

C. Division 32 Section “Site Concrete Work”.

1.4 DEFINITIONS

A. Clearing: Removal of trees, shrubs, bushes, and other organic matter found at or above original ground level.

B. Grubbing: Removal of stumps, roots, boards, logs, and other organic matter found at or below original ground level.

C. Topping: Removal of those portions of trees, bushes, and shrubs projecting above an elevation or plane shown or indicated on Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide all materials, equipment, and appurtenances required for completion of clearing work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces for conditions that will adversely affect execution, permanence, and quality of work of this Section.

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

3.2 PROTECTION

A. Public and Adjacent Properties: Protect in accord with applicable laws and ordinances.

B. Existing on-site features, including flora scheduled to remain: Protect from damage at all times.

1. Do not allow earth-moving equipment within the branch spread perimeter (drip line) of existing trees which are to remain.
2. Do not impact, trespass upon, or otherwise violate areas designated on Drawings as tree protection zones, easements, buffer zones, wetlands, or similar environmentally-sensitive areas.

C. Utilities:

1. Protect all active utility lines on-site.
2. Remove from site abandoned lines encountered during clearing and grubbing operations.
3. Capping and/or rerouting of active utility lines encountered during clearing and grubbing operations shall be performed as part of the work of other Sections.
4. Expeditiously repair damaged utilities at no cost to Owner.

D. Dust control:

1. Throughout entire construction period, effectively dust-palliate working area, unpaved roads, and involved portions of the site.
2. Palliation: Intermittently water and sprinkle with such frequency as will satisfactorily allay dust at all times. Chemical treatment of any type is not permitted.
3. Use of reclaimed water shall conform to requirements and guidelines of governing health authorities and be specifically approved by Owner.

E. Soil redistribution: Do not redistribute existing soils beyond immediate area of origin.

3.3 CLEARING

A. Limit of Clearing: Areas indicated on Drawings. Clearing limits shall be approved by Owner prior to starting clearing operations.

B. Remove trees, saplings, shrubs, bushes, vines, and undergrowth within limits of clearing as noted on drawings.

3.4 GRUBBING

A. Limits of grubbing: As specified for clearing.

B. Remove tree stumps and root systems completely and backfill void, unless removal damages roots of plants to remain. Refer to Division 31 Section "Excavation and Fill for Utilities" for protection of existing plants to remain.

C. For vegetation other than trees, remove stumps, roots, and matted roots to depths specified below:

1. Under footings: 18 inches.
2. Under walks: 12 inches.
3. Under planting areas: 12 inches.
4. Under fills: 8 inches.
5. Where footings, roads, walks, and other construction is on fill, the greater depth applies.

3.5 DISPOSAL

A. Burning of materials on-site is not permitted.

B. Removal:

1. Remove materials resulting from clearing and grubbing operations from site daily as they accumulate.
2. When work continues beyond normal working hours, do not allow materials to accumulate on-site for more than 48 hours.

3.6 TREE REMOVAL, RELOCATION, OR SALVAGE

A. Protect trees from damage until Owner removes trees indicated on Drawings to be salvaged or removed by Owner.

B. Cut and remove other trees from site unless designated on Drawings to remain or be relocated.

C. Verify with Owner which trees are to be salvaged, removed, or relocated.

END OF SECTION 311000

SECTION 31 20 00

EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes (but Is Not Necessarily Limited to):

1. Rough grading earthwork.

2. Excavating, trenching, and backfill.

1.2 UNIT PRICES

A. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following:

1. 24 inches outside of concrete forms other than at footings.

2. 12 inches outside of concrete forms at footings.

3. 6 inches outside of minimum required dimensions of concrete cast against grade.

4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.

5. 6 inches beneath bottom of concrete slabs on grade.

6. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

B. Unit prices for rock excavation include replacement with approved materials.

1.3 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe or conduit in a trench, including haunches to support sides of pipe or conduit.

2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Layer placed between the subbase course and asphalt paving.

C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

F. Engineered Fill: Fill material placed at the direction of the soils engineer.

G. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by the owner. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by the owner. Unauthorized excavation, as well as remedial work directed by the owner, shall be without additional compensation.

H. Fill: Soil materials used to raise existing grades.

I. Rock (project definition): Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering or ripping, when permitted:

1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-wide, short-tip-radius rock bucket; rated at not less than 120-hp flywheel power with bucket-curling force of not less than 25,000 lbf and stick-crowd force of not less than 18,700 lbf; measured according to SAE J-1179.

2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 45,000-lbf breakout force; measured according to SAE J-732.

J. Rock (ASTM definition): Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material 3/4 cu. yd. (0.57 cu. m) or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows/2 inches (97 blows/50 mm).

K. 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.

L. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

M. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

N. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Drainage fabric.

B. Samples: For the following:

1. 10-lb. samples, sealed in airtight containers, of each proposed soil material from on-site or off-site borrow sources. This does not include Owner stockpile.

2. 12-by-12-inch sample of drainage fabric.

3. 12-by-12-inch sample of separation fabric.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance with the following requirements:

1. Classification according to ASTM D 2487 of each on-site or off-site borrow soil material proposed for fill and backfill.

2. Laboratory compaction curve according to ASTM D 1557 for each on-site or off-site borrow soil material proposed for fill and backfill.

3. Laboratory compaction curve according to ASTM D 1557 for each on-site or off-site borrow soil material proposed for fill and backfill.

D. Blasting will not be permitted.

1.5 REFERENCES

A. Standard Specifications for Public Works Construction (“Greenbook”), most current edition.

1.6 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

1.7 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving existing facilities unless permitted in writing by owner and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify owner not less than two weeks in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without owner’s written permission.

3. Contact utility-locator service for area where Project is located before excavating.

B. Cooperate with Owner and utility companies in maintaining respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

C. Demolish and completely remove from site existing underground utilities to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations on Owners's stockpile.

B. Satisfactory Soils: Refer to Standard Specifications for Public Works Construction (SSPWC) "Greenbook" for recommendations, as approved by the geotechnical engineer.

C. Unsatisfactory Soils: Refer to Standard Specifications for Public Works Construction (SSPWC) "Greenbook" for recommendations. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials, as approved by the geotechnical engineer.

E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; with at least 90 percent passing a 1-1/2- inch sieve and not more than 12 percent passing a No. 200 sieve. Must meet Caltrans standards.

F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve for Class II Base.

G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve. Must meet Caltrans standards, as approved by the geotechnical engineer.

H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

I. Drainage Fill: Washed, narrowly 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 0 to 5 percent passing a No. 8 sieve.

J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 DRAINAGE FABRIC

A. Non-woven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods.

1. Grab Tensile Strength: 120 lbf; ASTM D 4632.

2. Tear Strength: 40 lbf; ASTM D 4533.

3. Puncture Resistance: 50 lbf; ASTM D 4833.

4. Water Flow Rate: 150 gpm per sq. ft.; ASTM D 4491.

5. Apparent Opening Size: No. 50; ASTM D 4751.

PART 3 EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. 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.

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. 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.

2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

B. Classified Excavation: Excavation to subgrade elevations classified as earth and rock. Rock excavation will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

1. 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 other materials not classified as rock or unauthorized excavation.

a. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

2. Rock excavation includes removal and disposal of rock.

a. Do not excavate rock until it has been classified and cross-sectioned by owner's representative.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavation for Mechanical or Electrical Utility Structures: Excavate to required elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended for bearing surface.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to required cross sections, elevations, and grades.

B. Excavations shall be in accordance with the Standard Specifications for Public Works Construction (SSPWC) "Greenbook" prepared for this Project.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to required gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of minimum of 24" below finished grade.

B. 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, unless otherwise required to meet minimum cover.

1. Clearance: unless otherwise shown on the drawings, 12 inches on each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and 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. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Depth: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 APPROVAL OF SUBGRADE

A. Notify owner when excavations have reached required subgrade.

B. If owner determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by rain, accumulated water, or construction activities, as directed by owner.

3.9 UNAUTHORIZED EXCAVATION

A. Intentionally left blank.
B. Fill unauthorized excavations under other construction or utility pipe as directed by owner.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile 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 a minimum distance equal to the depth of excavation. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.

2. Surveying locations of underground utilities for record documents.

3. Inspecting and testing 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.

3.12 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Backfill trenches excavated under footings and within 18 inches of bottom of footings; fill with concrete to elevation of bottom of footings.

C. Place and compact initial backfill of subbase 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.

D. Coordinate backfilling with utilities testing.

E. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.

F. Place and compact final backfill of satisfactory soil material to final subgrade.

G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. 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 engineered fill.

4. Under building slabs, use engineered fill.

5. Under footings and foundations, use engineered fill.

3.14 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, or contain frost or ice.

2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Unless otherwise specified on the drawings or in the soils report, compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill material at 95 percent.

2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 95 percent.

3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 90 percent.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free from 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. Stripping. When fills are to be constructed over cultivated or fallowed land, the entire area upon which the fill is to be constructed shall first be cleared of vegetation and then smoothed with a blade grader. When fills are to be constructed over sodded surfaces, the sod shall be stripped to a depth of 2 inches. These smoothed or stripped surfaces shall then be rolled to

the specified density required for fill prior to the fill material placement. Dispose of stripped material as waste and completely remove from the Project site.

4. Conservation of Topsoil. Deposit topsoil in storage piles convenient to the areas which are subsequently to receive application of topsoil. Stockpile topsoil free of roots, stones and other undesirable material as specified in Paragraph 2.1 B above. Keep topsoil, when stored, separate from other excavated materials. Cover storage piles as required to prevent wind blown dust.

5. Fills. Construct fills at the locations and to the lines and grades indicated on the Drawings. Insure that the completed fill corresponds to the shape of the typical sections shown on the Drawings or meets the requirements of that particular case. Use all approved material removed form the excavation in forming the necessary fill. All fill material shall be free from logs, stumps, sod, weeds, trash or other perishable material, and from all stones having a maximum dimension greater than 6 inches. No stones shall be permitted in the top 12 inches of fills. Place the material in successive horizontal layers not exceeding 8 inches in loose depth. Use a blade grader to keep fill material spread uniformly. Remove any soft sections, holes or depressions to required grades and refill with material as approved, and shape the entire area to line, grade, and cross section and thoroughly compact as specified. Contractor is responsible for adjustment of the moisture content of the fill material so that the specified compaction can be obtained. The rough grade for the entire Project site or portion thereof shall be approved by Project Manager before placement of any topsoil.

   a. Subgrade Preparation. Subgrades for all drives, parking areas, sidewalks and other structures shall be shaped, dressed, moistened and compacted as specified Test the subgrade for crown, elevation and density in advance of placing pavement.

   b. Spreading of Topsoil:. Upon completion of rough grading, spread the stockpiled topsoil for a uniform depth of 6 inches, after settlement, over all areas graded not receiving other surfacing, just prior to the sodding or landscaping operation. Before spreading the topsoil, scarify the graded areas for a depth of 3 inches and repair all settlements and washes.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch.

2. Walks: Plus or minus 1 inch.

3. Pavements: Plus or minus 1/2 inch.

C. Finished Grading. Accomplish uniformly smooth grading of all areas covered within the limits of the work, including excavated and filled sections and adjacent transition areas so that the finished surface is smooth, compacted and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from blade-grader operations except as otherwise specified. Finish all swales so as to drain readily.

1. Backfill material shall be the same as specified for fill and shall be placed and compacted as specified for fill unless otherwise noted.

D. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot (3-m) straightedge.

3.17 SUBSURFACE DRAINAGE

A. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a 6-inch course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe in a minimum of 12 inches of filter material and wrap in drainage fabric, overlapping sides and ends at least 6 inches.

1. Compact each course of filter material to 90 percent of maximum dry unit weight according to ASTM D 1557.

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade. Overlay drainage backfill with one layer of drainage fabric, overlapping sides and ends at least 6 inches.

1. Compact each course of filter material to 90 percent of maximum dry density according to ASTM D 1557.

2. Place and compact impervious fill material over drainage backfill to final subgrade.

3.18 BASE COURSES

A. Under pavements and walks, place base course on prepared subgrade and as follows:

1. Place base course material over subgrade.

2. Compact base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 90 percent of maximum dry unit weight according to ASTM D 1557.

3. Shape base to required crown elevations and cross-slope grades.

4. When thickness of compacted base course is 6 inches or less, place materials in a single layer.

5. When thickness of compacted base course exceeds 6 inches, place materials in equal layers, with no layer more than 8 inches thick loose material or less than 4 inches thick when compacted.

3.19 DRAINAGE COURSE

A. Under slabs-on-grade, install drainage fabric on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

B. Under slabs-on-grade, place drainage course on prepared subgrade and as follows, unless otherwise specified by the Geotechnical Engineer:

1. Compact drainage course to required cross sections and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

2. When compacted thickness of drainage course is 6 inches or less, place materials in a single layer.

3. When compacted thickness of drainage 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.

3.20 FIELD QUALITY CONTROL

A. Testing Agency: Owner will furnish a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design-bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Project Manager.

D. Testing agency will test compaction of soils in place according to ASTM D 1556 and ASTM D 2922 as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.

2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.

3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.21 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 owner; reshape and recompact.

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 the greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property at Contractor’s expense.

B. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Project Manager.

1. Remove waste` material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property at Contractor's expense.

END OF SECTION

SECTION 320190

LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.1 SUMMARY

A. General: Provide Landscape Maintenance in accordance with Contract Documents.

B. Summary of Work: Provide all labor, equipment and materials required to provide Landscape Maintenance, complete, as indicated on Drawings and as specified herein.

1. This Section includes Landscape Maintenance as specified during progress of the work, after installation and for a period of 90 days after Preliminary Acceptance.

C. Related Documents:

1. Specification Section 321516 – Crushed Stone Surfacing (Decomposed Granite Paving).

2. Specification Section 328400 – Irrigation.

3. Specification Section 329100 – Soil Preparation.

4. Specification Section 329300 – Planting

1.2 SUBMITTALS

A. Quality Control Submittals:

1. Schedule of maintenance operations and monthly status reports including list of equipment, proposed materials for the job and watering schedule.

2. Licenses, permits and insurance that pertain to maintenance work as required by City, State or Federal government agencies.

3. Monthly record of all herbicides, insecticides and disease control chemicals used for the project.

B. Project Close-Out Submittal: Include in a single, 3-ring binder a Landscape Maintenance Manual containing an indexed collection of all schedules, records and permits listed above, as well as a documentation of accepted condition of planting and irrigation at Final Acceptance.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Experience: The Landscape Contractor or Maintenance Contractor shall have a full-time employee assigned to the job as foreman for the duration of the contract. He/she shall have a minimum of 4 years experience in landscape maintenance supervision, with

experience or training in turf management, entomology, pest control, soils, fertilizers and plant identification.

2. Labor Force: The landscape maintenance labor force shall be thoroughly familiar with and trained in the work to be accomplished and shall perform all tasks in a competent and efficient manner acceptable to Landscape Architect and Owner.

B. Requirements:

1. Supervision: The foreman shall directly supervise the labor force at all times. Immediately notify Landscape Architect Owner of all changes in supervision.

2. Identification: Provide proper identification at all times for landscape maintenance firm's vehicles and labor force. The labor force shall be uniformly dressed in a manner satisfactory to Owner.

1.4 PROJECT/SITE CONDITIONS

A. Site Visit: At the beginning of Maintenance Period visit and walk the site with Landscape Architect to clarify scope of work and understand existing project and site conditions.

B. Documentation of Conditions: Document general condition of existing trees, shrubs, vines, ground covers and lawn, recording all plant materials that are healthy, thriving, damaged, dead or dying.

1.5 SEQUENCING AND SCHEDULING

A. Perform all maintenance during hours mutually agreed upon between Owner and Contractor.

B. Work force shall be present at the Project Site daily, Monday through Friday, and as often as necessary to perform specified maintenance in accordance with the approved maintenance schedule.

1.6 WARRANTY

A. Specific Requirements: Refer to the following Specification Sections.

1. Specification Section 328400 – Irrigation.

2. Specification Section 329100 – Soil Preparation.

3. Specification Section 329300 – Planting.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: All materials and equipment shall be provided by Contractor except as specified below.

B. Water: Clean and potable, as available from Owner. Transport as required.

C. Fertilizers:

1. Tightly compressed slow-release and long lasting complete fertilizer tablets bearing manufacturer's label of guaranteed analysis of chemicals present.

2. Balanced, once-a-season application, controlled-release fertilizers with a blend of coated pills which supply controlled-release nitrogen, phosphorus and potassium, and uncoated, rapidly soluble pills containing nitrogen and phosphorus.

D. Herbicides, Insecticides, and Fungicides:

1. Best quality materials with original manufacturers' containers, properly labeled with guaranteed analysis.

2. Use non-staining materials.

E. Annuals/Perennials: Nursery grown in 6-inch pots, full, and healthy.

1. Flowering plants just ready to bloom.

2. Grasses at mature height.

F. Sod turf area.

G. Replacement Tree Staking and Guying Material: Match originally accepted existing materials on the site.

2.2 EQUIPMENT

A. General: Use only the proper tool for each job. Maintain all tools in sharp and properly functioning condition. Clean and sterilize pruning tools prior to usage.

B. Insect/Disease Prevention: Take all measures to prevent introduction of insect or disease-laden materials onto the site.

PART 3 - EXECUTION

3.1 ESTABLISHING THE MAINTENANCE PERIOD

A. Preliminary Review: As soon as planting is substantially complete in accordance with Drawings and Specifications hold a preliminary review to determine the condition of the work.

B. Date of Review: Notify Landscape Architect at least 5 working days prior to the anticipated date of review.

C. Beginning of Maintenance Period: The date on which Landscape Architect issues a Letter of Substantial Completion to Contractor.

3.2 PREPARATION

A. Protection:

1. Protect all new planting areas from damage of all kinds from commencement of work until sufficiently established or until Final Acceptance.

2. Provide temporary protection fences, barriers and signs as required for protection.

B. Replacements:

1. Immediately treat or replace all plants that become damaged or injured as a result of Contractor's operations or negligence as directed by Landscape Architect and at no cost to Owner.

2. Replacement plants shall match size, condition and variety of plants to be replaced.

3.3 PLANTING

A. Watering Basins:

1. Maintain all watering basins around plants so that enough water can be applied to establish moisture through major root zones.

2. For supplemental hand watering of watering basins use a water wand to break the water force.

a. Do not use "jet" type watering equipment.
b. Do not permit crown roots to become exposed to air due to dislodging of soil and mulch.

3. Maintain originally specified depth of mulch to reduce evaporation and frequency of watering.

4. During the rainy season open basins to allow surface drainage away from the root crowns where excess water may accumulate. Restore watering basins at the end of the rainy season.

5. At the end of the rainy season re-form watering basins at trees and shrubs as indicated on Drawings.

B. Resetting:

1. Reset plants to proper grades and upright position.

C. Weed Control:

1. All areas between plants including watering basins shall be weed free at all times.

2. Use only recommended and legally approved herbicides to control weed growth.

3. Avoid frequent soil cultivation that destroys shallow roots and breaks the seal of pre-emergent herbicides.

D. Pruning:

1. All pruning operations shall be directed and supervised by a California Certified Arborist.

2. 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 a vertical spacing of 18 inches to 48 inches and a radial orientation so as not to overlay one another.

3. Prune trees to eliminate diseased or damaged growth and narrow V-shaped branch forks that lack strength. Reduce toppling and wind damage by thinning crowns.

4. Prune trees to maintain growth within space limitations, maintaining a natural appearance and balancing crown with roots.

5. Stripping of lower branches ("raising up") of young trees is not permitted.

6. Retain lower branches in a "tipped back" or pinched condition to promote caliper trunk growth (tapered trunk). Do not cut back to fewer than 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.

7. Thin 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.

8. As necessary, prune damaged trees or those that constitute health or safety hazards at any time of year.

9. Make all cuts clean and close to the trunk, without cutting into the branch collar. "Stubbing" is not permitted. Cut smaller branches flush with trunk or lateral branch. Make larger cuts (1-inch diameter or larger) parallel to shoulder rings, with the top edge of the cut at the trunk or lateral branch.

10. Branches too heavy to handle shall be precut in 3 stages to prevent splitting or peeling of bark. Make the first 2 cuts 18 inches or more from the trunk to remove the branch. Make the third cut at the trunk to remove the resulting stub.

11. Do not prune or clip shrubs into balled or boxed forms unless specifically required by the design as indicated on Drawings.

12. Take extreme care to avoid transmitting disease from an infected plant to other plants. Properly sterilize pruning tools before going from an infected plant to all other plants.

E. Staking and Guying of Trees:

1. Inspect stakes and guys at least once a month to check for rubbing that causes bark wounds.

2. Repair and replace staking and guying as indicated on Drawings and as specified in Specification Section 329300 – Plants.

F. Maintenance of Existing Plants to Remain:

1. General: Conform to all applicable paragraphs regarding pruning, watering, spraying and fertilizing of new plant materials as specified in this section.

2. Symptoms: Be alert to symptoms of construction damage to existing plants as evidenced by wilting, unseasonal or early flowering, loss of leaves and insect or disease infestation due to declining vigor.

3. Notification: Immediately submit in writing evidence of declining vigor upon discerning the problem. Take appropriate interim measures to mitigate the severity of the problem as specified herein.

4. Proposal: Submit written proposal and cost estimate for the correction of all conditions before proceeding with correction work.

3.4 GROUND COVER

A. Watering:

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 ground cover.

B. Weed Control:

1. Control weeds, preferably 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 Landscape Architect actual completion date of planting installation and rate of prior application of fertilizers.

2. New Plant Materials: Place one 5-gram tablet (20-10-5; N-P-K) beside the root ball about 1 inch from root tips.

3. Established Plant Materials: Do not use complete fertilizers unless soil test shows specific nutrient deficiencies.

D. Mowing and Edging:

1. Mow lawns when they reach a 2-inch height.

2. Edge ground cover to keep in bounds. Trim top growth as necessary to achieve an overall even appearance.

3. Ground cover species that lend themselves to mowing shall be mowed to the specified height above finish 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 corrected without charge to Owner.

3.5 LAWNS

A. Watering:

1. Water lawns at such frequency as weather conditions require to replenish soil moisture to a 6-inch depth below root zone.

2. During hot weather provide a total of 1-1/2 inches of water weekly in 3 applications per week.

3. Water at night if irrigation system is electrically controlled. Otherwise, watering shall be done during early morning hours.

B. Weed Control:

1. Control broadleaf weed with selective herbicides.

2. In areas where crabgrass has infested the lawn apply a selective post-emergent herbicide as soon as possible and prior to flowering.

3. Apply pre-emergent herbicides such as Dacthal, Balan, or Betasan prior to crabgrass germination.

4. Do not irrigate for 48 hours after application of herbicidal sprays.

5. Coordinate application of herbicides with thatch control and reseeding schedule as described in Paragraph E below.

C. Mowing and Edging:

1. Mow lawns when they reach a 2-inch height.

2. Trim edges at least twice a month or as needed for neat appearance. Vacuum clippings.

D. Reseeding of Lawn Areas: Match existing seed mix of adjacent areas.

E. Fertilizers:

1. Recently Seeded/Sodded Lawn Areas: Verify previous applications of fertilizer(s).

2. Established Lawn Areas: Apply a slow release (3 to 5 months) fertilizer (21-8-8; N-P-K) once in Spring and once in Fall at the following rates:

Program	1000 Sq. Ft.	Acre
Optimum	15 lbs.	650 lbs.
Medium	12 lbs.	500 lbs.
Low	8 lbs.	350 lbs.

3. Apply fertilizer when grass is dry and preferably after mowing. Do not apply during hot weather or when grass is under stress. Water immediately after application.

4. Apply only nitrogen unless a soil test shows a specific nutrient deficiency.

5. If soil pH falls below 6.0, then a basic fertilizer such as calcium nitrate may be preferable to an acidic fertilizer. Follow the recommendations of the soil testing agency Wallace Laboratories, (310) 615-0116.

3.6 INSECTS, PESTS, AND DISEASE CONTROL

A. Inspection: Inspect all 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 blotched leaves or needles.

3. Unusually light green or yellowish green color that is inconsistent with the 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 within the area or adjacent areas.

3.7 IRRIGATION SYSTEM

A. General:

1. Repair without additional charge to Owner all damages to system caused by Contractor's operations. Perform all repairs within 1 watering period.

2. Do not run the irrigation system during rainy conditions. Set and program automatic controllers for seasonal water requirements.

3. Twice a month, use a probe or other acceptable tool to check the root ball moisture of representative plants as well as the surrounding soil.

B. Cleaning and Monitoring the System:

1. Continually monitor the irrigation system to verify that it is functioning properly and as designed. Adjust irrigation scheduling program as necessary due to changing field and seasonal climate conditions.

2. Prevent spraying on windows and building walls by balancing the throttle control on the remote control valves and the adjustment screws on the sprinkler heads.

3. Do not allow water to atomize and drift.

3.8 TERMINATION OF THE MAINTENANCE PERIOD

A. Final Acceptance Procedure:

1. Work will be accepted by Landscape Architect upon satisfactory completion of all work, including Maintenance Period, but exclusive of replacement of materials under the Warranty Period.

2. Submit a written request to Landscape Architect for Final Acceptance Review at least 5 working days prior to the anticipated Final Acceptance Review date, which is to be at the end of the Maintenance Period.

B. Corrective Work:

1. Work requiring corrective action or replacement shall be performed within 10 calendar days after the Final Review.

2. Replace materials and perform corrective work in accordance with Drawings and Specifications. Contractor shall perform this work at no cost to Owner.

3. After corrective work is completed, Contractor shall again request a Final Acceptance Review and follow the procedure described above.

4. Continue to maintain all landscaped areas until such time as all corrective measures have been completed and accepted by Landscape Architect.

C. Conditions for Acceptance of Work at End of Maintenance 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 all plants that do not meet 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 Landscape Architect issues a Letter of Final Acceptance. Upon Final Acceptance, Owner will assume responsibility for maintenance of the work.

3.9 CLEANING

A. Dispose of all pruned materials, vacuum all lawn clippings and leaves, sweep all walkways and rake smooth all mulched areas.

B. Remove from site and legally dispose of evidence of maintenance activities including excess subsoil, unsuitable soil, all containers, trash and debris off of Owner’s property at Contractor's cost.

3.10 CLOSE OUT

A. Landscape Maintenance Record: Submit to Owner a binder with all documentation and records required and utilized during the Maintenance Period.

B. Keys and Identification: Return all keys and identification materials supplied by Owner for the purpose of site access.

END OF SECTION 320190

SECTION 321313

SITE CONCRETE WORK

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 SECTION INCLUDES

A. Site concrete work, including base and subgrade preparation, formwork, reinforcing steel, concrete, and accessory materials for:

1. Pavement, and curbs.
2. Walkways.
3. Retaining walls, and similar structures.
4. Footings and similar work of other trades.
5. Thrust blocks for pressure piping systems.
6. Mechanical and electrical equipment pads.
7. Other site concrete work as indicated on Drawings.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Division 31 Section “Site Clearing”.

B. Division 31 Section "Grading".

C. Division 32 Section "Concrete Paving Joint Sealants".

D. Precast concrete and other use concrete specified as part of Division 22, Division 23 and Division 26.

1.4 DEFINITIONS

A. Slip resistance: Slip index of not less than 0.5 when tested dry and wet (with an unbroken film of pure water) in accord with ASTM F 1677 or ASTM F 1679, using a Neolite test pad.

1.5 QUALITY ASSURANCE

A. Tests and inspections:

1. Testing laboratory services: Refer to Division 01 Sections.
2. Soil bearing and compaction:

a. Test methods:

1) Maximum dry density of backfill materials shall be determined by ASTM D 1557, Procedure A.
2) Field density tests shall be determined by ASTM D 1556, ASTM D 2922, or ASTM D 2937.

b. Required tests:

1) Backfill material: Determine suitability of backfill material not previously evaluated.
2) Maximum density tests: Determine optimum moisture content and maximum dry density of backfill materials placed and compacted.
3) Field density tests: Determine in-place density of backfill materials placed and compacted. one test for every 250 cubic yard of material placed and one test for each 1 foot vertical lift.
4) Other tests as may be required by Owner.

c. Required inspections:

1) Excavation inspection: Detailed inspection of exposed excavations prior to placing backfill material.
2) Placement and compaction inspection: Continuous inspection and monitoring.

3. Concrete: In accord with SSPWC Section 201-1.1.4 and as specified herein.

a. Portland cement: Furnish cement mill test reports and manufacturer's certification that cement complies with specification requirements.
b. Required tests:

1) Aggregate:

a) Hardrock aggregate: Test in accord with ASTM C 33.
b) Do not deliver aggregates to site or ready-mix plant until pit source has been approved, and plant, capacity, and ability to produce a uniform and continuous product has been verified.
c) Take samples from aggregate stockpiles assigned to project.

2) Slump tests: Make one slump test in accord with ASTM C 143 for each set of test cylinders: Make additional tests as may be ordered by Owner.

a) Make and keep an accurate record of all tests.
b) Maximum slumps: As specified hereinafter.

3) Test cylinders: Take one sample of four cylinders from each day's placement of 50 cubic yards or fractional part thereof of each mix design in accord with ASTM C 172. Take samples at evenly spaced intervals as concrete is deposited in forms. Mark cylinders with date, sample number, and location in structure from which sample was taken. Do not take more than one sample of four cylinders from any location or batch of concrete.

a) Make and store cylinders in accord with ASTM C 31.
b) Curing: At the end of 24 hours, take cylinders to laboratory and store under moist curing conditions at approximately 70°F until tested.

c) Testing: Test cylinders in accord with ASTM C 39. Test one cylinder at age of 7 days for information and two cylinders at 28 days for acceptance. Maintain one cylinder in reserve.
d) Seven-day strength: Not less than 60 percent of specified ultimate 28-day strength.
e) Mix adjustment: Should test results indicate concrete strength below specified 7-day or 28-day minimum requirements, decrease water/cement ratio and adjust mix proportions as necessary to achieve specified minimum strengths.
f) Concrete failures: Should test results indicate that concrete strength requirements for any portion of work does not conform to 28-day minimum requirements, secure core or prism specimens of hardened concrete and test in accord with ACI 301 and ASTM C 42.
g) Laboratory shall secure and test specimens under Owner's direction.

c. Ready-mix plant inspections:

1) Testing laboratory shall provide and maintain continuous inspection at plant to check sieve analysis for quality and moisture content of aggregates, check mix with design mixes, check cement being used with test reports, check loading of mixer trucks, and certify quantities of materials loaded in each mixer truck.
2) Certification: Provide batch tickets signed by dispatcher and testing laboratory inspector at ready-mix plant. Each batch ticket shall state batch quantities of cement, water, fine aggregates, coarse aggregates, and admixture contained in each truck load.
3) Deliver to Owner's representative on job site a properly signed ticket with each load of ready-mix concrete.

4. Reinforcing steel:

a. Quality control of identifiable steel:

1) Submit to laboratory copies of mill certificates for all types, sizes, and heats of reinforcing steel intended for use in the work. Include the following information:

a) Source of steel.
b) Description.
c) Heat number.
d) Yield point.
e) Ultimate tensile strength.
f) Elongation percentage in 8 in. length.
g) Bend test results.
h) Chemical analysis, including carbon equivalent (CE) of ASTM A 615 bars to be welded.

2) All costs in connection with tests and inspections of identifiable steel will be paid by Owner.

b. Quality control of unidentifiable steel:

1) When steel cannot be identified, testing laboratory shall make one series of tensile tests and one series of bend tests in accord with ASTM A 370 or ASTM A 615, for each 5 tons or fractional part thereof of each size and kind

of reinforcing steel. Make tests using a minimum of two separate samples. Test full sections of bars as rolled.

2) All costs in connection with tests and inspections of unidentifiable steel will be paid by Contractor.

5. Payment:

a. Owner will pay all costs for all tests and inspections except retests and reinspections required because of failures.

b. All costs incurred for retests and reinspections required because of failure of original tests will be paid by Contractor.

B. Reference specifications and standards:

1. ACI: 301 Specifications for Structural Concrete for Buildings.
2. ACI: 305 Hot Weather Concreting.
3. ACI: 306 Cold Weather Concreting.
4. ASTM: A 370 Mechanical Testing of Steel Products.
5. ASTM: A 615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
6. ASTM: C 31 Making and Curing Concrete Test Specimens in the Field.
7. ASTM: C 33 Concrete Aggregates.
8. ASTM: C 39 Compressive Strength of Cylindrical Concrete Specimens.
9. ASTM: C 42 Drilled Cores and Sawed Beams of Concrete, Obtaining and Testing.
10. ASTM: C 143 Slump of Hydraulic Cement Concrete.
11. ASTM: C 172 Sampling Freshly Mixed Concrete.
12. ASTM: C 1107 Packaged Dry, Hydraulic-Cement Grout (Non-Shrink).
13. ASTM: D 1556 Density of Soil in Place by the Sand-Cone Method.
14. ASTM: D 1557 Moisture-Density Relations of Soils Using 10 lb. Rammer and 18 in. Drop.
15. ASTM: D 2922 Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
16. ASTM: D 2937 Density of Soil In-Place by the Drive-Cylinder Method.
17. ASTM: E 1155 Determining Floor Flatness and Levelness Using the F-Number System
18. ASTM: F 609 Using a Horizontal Pull Slipmeter (HPS).
19. ASTM: F 1677 Using a Portable Inclineable Articulated Strut Slip Tester, (PIAST).
20. ASTM: F 1679 Using a Variable Incidence Tribometer, (VIT).
21. SSPWC: Standard Specifications for Public Works Construction ("Green Book").

1.6 SUBMITTALS

A. Procedure: In accordance with Division 01 Sections.

B. Shop drawings: Plans, elevations, sections, and details, including layout of components and accessories. Indicate dimensions, clearances required, utility service requirements, materials, and finishes.

C. Manufacturer's detailed technical materials data, including technical bulletins, drawings, guides, and manuals, as applicable to the work of this Project, for the following:

1. Admixtures.
2. Curing materials.
3. Joint materials.
4. Nonshrink grout, including test data.

D. Certifications:

1. Cement mill test reports and certification.
2. Admixture certification, including chloride ion content.
3. Ready-mix batch plant tickets.
4. Reinforcing steel mill certifications.

E. Concrete mix designs: Submit, for approval, certified concrete mix designs for initial and any subsequent changes in mix designs.

1.7 PROJECT CONDITIONS

A. Existing conditions:

1. Do not conceal or cover any work until required tests and inspections have been performed and accepted.
2. Do not fabricate items which require fitting to other building elements, until dimensions have been verified at the site.

B. Environmental requirements: Unless otherwise recommended by product or system manufacturer or reference specifications or standards, conform to the following:

1. Do not place concrete when the ambient temperature is 35°F or lower or is expected to go below that temperature within 24 hours.
2. Do not place concrete during rain that will cause surface damage to concrete.
3. Hot weather concreting procedures: In accord with ACI 305.
4. Cold weather concreting procedures: In accord with ACI 306.

C. Traffic control:

1. Maintain vehicular and pedestrian traffic control during concrete operations.
2. Provide flagmen, barricades, warning signs, and warning lights for movement of traffic and safety, and to cause the least interruption of work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete: In accord with SSPWC Section 201-1, Portland Cement Concrete, type as indicated on Drawings.

1. Cement: Conform to SSPWC Section 201-1.2.1.
2. Admixtures: Conform to SSPWC Section 201-1.2.4.
3. Fine aggregates: Conform to SSPWC Section 200 1.5.3
4. Coarse aggregates: Conform to SSPWC Section 200 1.4.
5. Design slumps and mix proportioning: SSPWC Sections 201-1.1.2 and 201-1.1.3 except as follows.

B. Formwork: Wood or equivalent metal, conforming to SSPWC Section 303-1.3.

C. Reinforcement: Conform to SSPWC Section 201-2.

D. Curing materials: Liquid or equivalent sheet membrane, conforming to SSPWC Section 201-4, except as specified herein.

E. Joint materials:

1. Construction joints: Preformed galvanized steel sheet or resawn wood.
2. Expansion joints: Premolded resilient filler, conforming to SSPWC Sections 201-3, except as specified herein.

F. Borrow material (for fill): Nonexpansive, predominantly granular material:

1. Particles less than 1 inches in any dimension;
2. Free of organic and inorganic debris;
3. Not more than 12 percemt by weight passing the No. 200 sieve.
4. Acceptable to a geotechnical engineer retained by Owner.

G. Non-shrink grout: Prepackaged, nonshrink, nonmetallic, natural aggregate grout conforming to ASTM C 1107, with minimum 28-day compressive strength of 5000 psi.

1. Hi-Flow or NS Grout by Euclid Chemical Company.
2. Five Star Grout by Five Star Products.
3. Master Flo 713 or 928 by Master Builders, Inc.

H. Integral mineral coloring pigments: Provide pure synthetic or natural mineral oxide colors as selected by Landscape Architect.

1. Chromix by L.M. Scofield Co., Longwood, FL, Los Angeles, CA.
2. Davis Colors, Beltsville, MD, Los Angeles, CA.
3. Lambco Colors by Lambert Corp. of Florida, Orlando, FL.
4. Landers-Segal Color Co., Inc., Passaic, NJ.
5. Solomon Colors, Springfield, IL.

2.2 INTEGRALLY COLORED CONCRETE

A. Provide integral color concrete for concrete pavements and other concrete work indicated on Drawings to be colored.

B. Consolidate color admixture in accord with manufacturer's instructions, using pigment proportions as required to match Architect-approved samples.

PART 3 - EXECUTION

3.1 PREPARATION

A. Compact top 6 inches subgrade to 95 percent of the Modified Proctor maximum dry density.

B. Do not allow traffic over prepared subgrade.

C. Uniformly moisten subgrade at time concrete is placed. Uniformly apply water immediately prior to concrete placement.

D. Accurately trim to required elevations, allowing for full thickness concrete.

3.2 WALKS AND SLABS

A. Construct in accord with SSPWC Section 303-5, except finishing and curing of integral color concrete shall be as follows.

1. Finishing:

a. Tamp freshly placed concrete with approved metal grid tampers not less than 12 inches by 12 inches in size so as to bring fines to top, then rod to uniform surfaces at required levels.

1) Float and trowel finish as soon as surface becomes workable.
2) Provide slopes as indicated on Drawings, or as directed by Landscape Architect.

b. During finishing maintain adequate surface moisture and reduce plastic shrinkage as recommended by integral color manufacturer.

1) Immediately after fresh concrete has been brought to a flat surface, a shiny film of moisture on top surface shall not be permitted to evaporate or as soon as the shiny surface disappears, it shall be restored and maintained until troweling.
2) Maintain surface moisture film as specifically recommended by integral color manufacturer applying evaporation retarder/finishing aids, frequent, light, fine spray applications of water rather than excessive wetting. Adjust extent of water spray in accord with temperature, humidity, and wind conditions.

c. Work concrete flatwork to achieve the following tolerances when measured in accord with ASTM E 1155.

1) Trowel finished surfaces: FF25/FL20 with minimum FF20/FL15.
2) Float and broom finished surfaces: FF20/FL17 with minimum FF15/FL10.

d. Surface finish textures:

1) Provide float, trowel, brush/broom, and/or abrasive-blasted surface textures to match Architect-approved sample panels.
2) Perform slip resistance testing to ensure that slip resistance of exposed concrete walking surface finishes is maintained. Follow testing procedures required for slip resistance testing of mock-up sample panels.

2. Curing: Cure, harden, and seal colored concrete flat slabs with compound(s) recommended by manufacturer of integral color concrete pigments. Curing, hardening, and sealing compound(s) shall not discolor, lighten, darken, stain, or impart other unsightly characteristics to colored concrete and shall be compatible with Owner's maintenance sealer.

B. Equipment pads and similar heavy-duty use areas indicated on Drawings: Apply bonding agent as recommended by topping manufacturer. Mix and apply extra heavy-duty, metallic-aggregate topping in accord with manufacturer's recommendations; unless indicated otherwise, provide minimum 1 inch topping thickness.

3.3 CURBS

A. Construct concrete curbs, bands, and other similar structures in accord with SSPWC Section 303-5, except finishing and curing of integral color concrete shall be as specified herein for walks and slabs.

3.4 SITE STRUCTURES

A. Construct retaining walls, thrust blocks, and similar structures to conform to requirements of SSPWC Section 303-1, Concrete Structures.

1. Formwork: Conform to SSPWC Section 303-1.3.
2. Placing reinforcing steel: Conform to SSPWC Section 303.17.
3. Placing concrete: Conform to SSPWC Section 303-1.8.
4. Consolidating (mechanically vibrating) concrete: Conform to SSPWC Section 303-1.8.4.

5. Construction joints: Unless indicated otherwise on Drawings, keyed type, conforming to SSPWC Section 303-1.8.6 and as specified herein.
6. Expansion joints: Unless indicated otherwise on Drawings, premolded resilient filler, conforming to SSPWC Sections 303-1.8.6.
7. Form removal: Conform to SSPWC Section 303-1.4.
8. Finishing: Conform to SSPWC Section 303-1.9.
9. Curing: Conform to SSPWC Section 303-1.10.

B. Additionally construct thrust blocks, and similar concrete structures related to other Divisions of work, in accord with requirements specified in applicable Sections and as indicated on Drawings.

3.5 JOINTS

A. Construction (pour) joints:

1. Place construction joints at all breaks in concrete placement lasting more than 1 hour and at color changes.
2. Unless otherwise indicated on Drawings, key construction joints for slabs 6 inches or more in thickness, except at expansion joints.

B. Expansion joints: Construct expansion joints with preformed resilient filler compatible with joint sealant materials, including joint backing, specified in Division 32 Section "Concrete Paving Joint Sealants".

C. Control joints:

1. Place control joints in all exterior flat concrete work, and other locations as indicated on Drawings.
2. Where control joints are not indicated on Drawings, verify specific types and layout with Architect prior to placing concrete. Size and shape of layout is dependent on specific areas, but do not space control joints farther apart than 10 feet o.c. in a square pattern (e.g., if a concrete walk is 4 feet wide, control joint should occur at equal spacing of approximately 4 feet o.c. along length).
3. Control joints may be one of two types, as indicated on Drawings: Saw-cut or hand-tooled.

a. Saw-cut:

1) Use at slabs on grade only. Make saw-cuts 1/8 inch wide. Do not cut through steel bar reinforcing. Depth of all saw-cuts shall not be less than 1/4 of slab thickness.
2) Verify hardness condition of concrete before commencing saw-cutting to ensure that saw will not fret, ravel, or spall edges of cuts nor dislodge aggregate. Use saw-cutting equipment appropriate for the hardness condition of concrete

b. Hand tooled: Make control joints with a "V" shaped jointing tool with rounded edges and a 3/4 inch deep keel.
c. Whether saw-cut or hand-tooled, accurately lay out areas and make control joints straight and true, with clearly defined angles.

4. Construction (pour) joints may be substituted for control joints where specifically approved by Architect.

3.6 PROTECTION OF COMPLETED WORK

A. During curing period, protect concrete from damaging mechanical disturbances, water flow, loading shock, and vibration.

END OF SECTION 321313

SECTION 321400

UNIT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete pavers set in sand setting beds.

1.2 ACTION SUBMITTALS

A. Product Data: For all materials proposed to be used for this scope of work.

B. Samples: (2) 3 inch by 9 inch by 10 cm sample of the stone pavers for review and approval by Landscape Architect.

C. Sample: (2) of 12” x 12” sample of the stone pavers for review and approval by Landscape Architect.

1.3 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

   1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

   2. Mock up shall be 12’ x 12’ of each unit paver proposed to be used including all joinery, edge treatment, unit color variation, and trimming and cutting for embedded items.

1.4 PROJECT CONDITIONS

A. Weather Limitations:

   1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
   2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and higher.

PART 2 - PRODUCTS

2.1 CONCRETE PAVERS

A. 3”x9” concrete unit paver. Manufacturer: Ackerstone (951) 674-0047, www.ackerstone.com, Color: Mesa Beige. Finish: Face Mix Grind.

B. 1’x1’ concrete unit paver. Manufacturer: Ackerstone (951) 674-0047, www.ackerstone.com, Color: Mesa Beige. Finish: Face Mix Grind.

C. Regional Materials: Provide concrete pavers that have been manufactured within 500 miles (800 km) of Project site from aggregates that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

D. Concrete Pavers: Solid paving units complying with ASTM C 936, made from normal-weight aggregates.

1. Manufacturers: Subject to compliance with requirements.

2. Color: to match Landscape Architect's approved sample.

2.2 EDGE RESTRAINTS

A. As shown on the drawings.

2.3 ACCESSORIES

A. Cork Joint Filler: Preformed strips complying with ASTM D 1752, Type II.

2.4 AGGREGATE SETTING-BED MATERIALS

A. Graded Aggregate for Base: Sound, crushed stone or gravel complying with ASTM D 448 for Size No. 8.

B. Drainage Geotextile: Nonwoven needle-punched geotextile fabric, 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. Apparent Opening Size: No. 40 (0.425-mm) sieve, maximum; ASTM D 4751.
2. Permittivity: 0.5 per second, minimum; ASTM D 4491.

C. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

2.5 MORTAR AND GROUT MIXES

A. General: Comply with referenced standards and with manufacturers' written instructions Discard mortars and grout if they have reached their initial set before being used.

B. Mortar Bed Bond Coat: Mix neat cement and latex additive to a creamy consistency.

C. Portland Cement-Lime Setting Bed Mortar: Type M complying with ASTM C 270, Proportion Specification.

D. Latex-Modified, Portland Cement Setting Bed Mortar: Comply with written instructions of latex-additive manufacturer and as necessary to produce stiff mixture with a moist surface when bed is ready to receive pavers.

E. Latex-Modified, Portland Cement Bond Coat: Proportion and mix Portland cement, aggregate, and liquid latex for bond coat to comply with written instructions of liquid latex manufacturer.

F. Packaged Grout Mix: Proportion and mix grout ingredients according to grout manufacturer's written instructions.

2.6

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

B. Cut unit pavers with motor-driven masonry saw equipment to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible.

1. For concrete pavers, a block splitter may be used.

C. Joint Pattern: As indicated on the Drawings.

D. Tolerances: Do not exceed 1/16-inch (1.6-mm) unit-to-unit offset from flush, level, or indicated slope, for finished surface of paving.

E. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

3.2 AGGREGATE SETTING-BED APPLICATIONS

A. Compact soil subgrade uniformly to at least 95 percent of ASTM D 698 laboratory density.

B. Place aggregate base, compact by tamping with plate vibrator, and screed to depth indicated.

C. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches (300 mm).

D. Place leveling course and screed to a thickness of 1 to 1-1/2 inches (25 to 38 mm), taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.

E. Treat leveling course with herbicide to inhibit growth of grass and weeds.

F. Set pavers with a minimum joint width of 1/16 inch (1.5 mm) and a maximum of 1/8 inch (3 mm), being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers as approved by Landscape Architect.

G. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf (16- to 22-kN) compaction force at 80 to 90 Hz.

3.3 MORTAR SETTING BED APPLICATIONS

A. Saturate concrete subbase with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.

B. Apply mortar bed bond coat over surface of concrete subbase about 15 minutes before placing mortar bed. Limit area of bond coat to avoid its drying out before placing setting bed. Do not exceed 1/16-inch (1.6-mm) thickness for bond coat.

C. Apply mortar bed over bond coat; spread and screed mortar bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades as indicated on Drawings.

D. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Before placing pavers, cut back, bevel edge, and remove and discard setting bed material that has reached initial set.

E. Wet brick pavers before laying if the initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

F. Place pavers before initial set of cement occurs. Immediately before placing pavers on mortar bed, apply uniform 1/16-inch (1.5-mm) thick bond coat to mortar bed or to back of each paver with a flat trowel.

G. Tamp or beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation before initial set of mortar; do not return to areas already set or disturb pavers for purposes of realigning finished surfaces or adjusting joints.

H. Spaced Joint Widths: Provide 3/8-inch (10-mm) nominal joint width with variations not exceeding plus or minus 1/8 inch (3 mm).

I. Grouted Joints: Grout paver joints complying with ANSI A108.10.

J. Grout joints as soon as possible after initial set of setting bed.

1. Force grout into joints, taking care not to smear grout on adjoining surfaces.

2. Tool exposed joints slightly concave when thumbprint hard.

K. Cure grout by maintaining in a damp condition for 7 days unless otherwise recommended by grout or liquid latex manufacturer.

L. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

1. Remove temporary protective coating as recommended by coating manufacturer and as acceptable to paver and grout manufacturers.

1.2 REPAIRS, PROTECTION AND CLEANUP

A. Remove and replace unit paving that is broken or damaged or does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Landscape Architect.

B. Protect unit paving from damage. Exclude traffic from unit paving for at least 14 calendar days after placement. When construction traffic is permitted, maintain unit paving as clean as possible by removing surface stains and spillage of materials as they occur. Treat, repair or replace damaged unit paving as directed by Landscape Architect.

C. Disposal: Remove from site and legally dispose of surplus construction materials and waste material including excess subsoil, unsuitable soil, forms, trash and debris off of Owner's property.

D. Maintain unit paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than 2 days before date scheduled for Substantial Completion observations.

END OF SECTION 321400

SECTION 321516

CRUSHED STONE SURFACING
(DECOMPOSED GRANITE PAVING)

PART 1 - GENERAL

1.1 SUMMARY

A. General: This Section includes the Crushed Stone Surfacing (Decomposed Granite), in accordance with Contract Documents.

B. Summary of Work: Provide all labor, equipment and materials required to procure and install the crushed stone surfacing (decomposed granite), complete, as indicated on Drawings and as specified herein.

C. Related Documents:

1. Specification Section 033000 – Cast-in-Place Concrete.

2. Specification Section 320190 – Landscape Maintenance.

3. Specification Section 329300 – Planting.

1.2 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed crushed stone surfacing (decomposed granite) work similar in material, design, and extent to that indicated on Drawings for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Design Intent: Finished crushed stone surfacing (decomposed granite) shall be accessible by wheelchair, firm, stable, and slip resistant. It shall not show signs or tracks of pedestrian foot prints or significant vehicle tracks when used. Surface movement of crushed stone surfacing (decomposed granite) shall be minimal.

1.3 SUBMITTALS

A. Sample: Provide current sieve analysis and 1/4 cubic foot sample of crushed stone surfacing (decomposed granite) material for approval.

B. Mock-Up: Provide a 5-foot by 5-foot minimum on-site mock-up of the approved crushed stone surfacing (decomposed granite) material. The mock-up is to be reviewed and approved by Landscape Architect prior to installation of work. Approved mock-up shall be protected and remain on site until crushed stone surfacing (decomposed granite) work is complete and approved. Approved mock-up that adheres to the size and location as indicated on Drawings may be kept as a portion of the final site work with approval of Landscape Architect.

C. Provide Manufacturer’s data on D.G. Stabilizer.

PART 2 - MATERIALS

2.1 SOIL STERILANT

A. Treflan Emulsifiable Concentrate.

2.2 BASE COURSE

A. 3/4-inch minus compacted crushed rock.

2.3 CRUSHED STONE SURFACING (DECOMPOSED GRANITE)

A. Clean 1/4-inch minus crushed stone surfacing (decomposed granite) with fines.

1. Available from:

a. Southwest Boulder and Stone (760) 451-3333
b. KRC Rock (760) 744-1036
c. Or approved equal.

2. Color: See Drawings.

B. Crushed stone surfacing (decomposed granite) shall meet the following sieve analysis:

Sieve Size	% Retained	% Passing
9.5 mm (3/8”)	0	100
6.3 mm (1/4”)	5 - 20	80 - 95
4.75 mm (#4)	10 - 20	60 - 80
2.36 mm (#8)	20 - 35	35 - 60
600 microns (#30)	20 - 35	15 - 35
0.075 microns (#200)	5 - 20	8 - 12
Pan		8 – 14

2.4 MULTI PURPOSE GRAVEL

A. Clean 3/4-inch crushed gravel.

1. Available from:

a. Southwest Boulder and Stone (760) 451-3333
b. KRC Rock (760) 744-1036
c. Or approved equal.

2.5 WATER

A. Water: Clean and potable water.

2.6 DECOMPOSED GRANITE STABILIZER

A. "Stabilizer" by Gail Materials, (951) 667-6102, www.gailmaterials.com, Natricil or approved equal.

B. Approved equal shall be a non-toxic, colorless, odorless and organic binder that binds crushed stone surfacing (decomposed granite) together to produce a firm texture as approved by Landscape Architect.

1. Installation shall match Landscape Architect-approved sample and mock-up.

2.7 GEOTEXTILE FABRIC

A. 100% polypropylene needle-punched engineering fabric, non-woven, by Grace, Mirafi or approved equal. Physical properties as recommended by product manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Prior to starting all work of this section, carefully inspect work installed by other trades and verify that all such work is complete to the point where this installation may properly commence. Start of work denotes acceptance of existing conditions.

3.2 PREPARATION

A. Make all necessary measurements in the field to ensure conformance to dimensions and finish elevations as indicated on Drawings.

B. Soil Sterilant:

1. Mix soil sterilant in sprayer tank with clean water according to manufacturer's latest printed specifications. Use sprayer that will apply the solution uniformly, without disturbing the soil.

2. Apply solution to dry soil surface at a rate of 3.5 gallons per 1000 square feet.

a. Do not apply when wind velocity exceeds 10 mph or during or after rain.

3. Shake or stir the spray solution prior to each application.

4. Avoid spraying on walls or over-spraying into areas to receive planting.

5. Immediately after application of spray solution, thoroughly incorporate the solution into the soil to a depth of 2 to 4 inches per manufacturer's recommendations.

6. Do not use sterilant within 4 feet of tree planting locations or within the drip lines of existing trees.

C. Do not install during rainy conditions.

3.3 BASE COURSE

A. Verify that all related work is completed before starting placement of base course.

1. Using a flat plate compactor, re-compact disturbed subgrade to a firm condition as approved by Landscape Architect.

2. Depth of Base Course:

a. 6-inch depth for pedestrian path.
b. 12-inch for vehicular path.

3. Verify compaction of base aggregate and replace any unacceptable areas. Place and compact to 95% compaction as specified.

4. Confirm that base has been properly placed and compacted. Repair any areas that are of improper width or thickness and any areas that fail to achieve required compaction.

3.4 CRUSHED STONE SURFACING (DECOMPOSED GRANITE)

A. Verify that all related work is completed before starting placement of crushed stone surfacing (decomposed granite) including concrete or metal edging.

B. Mixing crushed stone surfacing (decomposed granite): The material shall be thoroughly blended with a cement mixer, paddle type blades, not screw type blades.

1. It is essential that the Stabilizer be mixed thoroughly and uniformly with crushed stone surfacing (decomposed granite).

2. Blend the 12 - 16 lbs. of Stabilizer per ton of crushed stone surfacing (decomposed granite) or per manufacturer's written instructions.

C. Place crushed stone surfacing (decomposed granite) roughly into position. Place sufficient material to allow for compaction.

D. Level surface. Do not compact crushed stone surfacing (decomposed granite) for 6 hours after placement and up to 48 hours or as directed by manufacturer's written recommendations.

E. A 1-ton to 5-ton roller shall be used for compaction to achieve a minimum of 90 percent relative compaction as determined by standard Proctor maximum dry density.

1. Do not use a vibratory or flat plate compactor for compaction.

F. Place additional crushed stone surfacing (decomposed granite) mixed with Stabilizer to meet required finished grades and re-compact after required waiting period.

G. Keep people, bicycles and vehicles off of the compacted crushed stone surfacing (decomposed granite) until it dries to stable moisture content.

3.5 MULTI PURPOSE GRAVEL

A. Verify that all related work is completed before starting placement of crushed gravel including concrete or metal edging.

B. Place gravel roughly into position. Place sufficient material to allow for compaction.

3.6 PROTECTION

A. Protect all adjacent work by others, reference points, monuments and markers. Replace or repair damaged items at no cost to Owner and as acceptable to Landscape Architect.

3.7 CLEANING

A. Remove from site and legally dispose of surplus construction materials and waste material including excavated soil, trash and debris off of Owner's property.

END OF SECTION 321516

SECTION 32 17 26

DETECTABLE WARNINGS

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section specifies furnishing and installing surface applied polyurethane detectable warning mat where indicated, using an exterior grade tactile warning surface described herein.

1.2 RELATED DOCUMENTS

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

1.3 SUBMITTALS

A. Refer to Division 1 for procedures.

B. Product Data: Submit manufacturer's literature describing products, installation procedures and routine maintenance.

C. Samples for Verification Purposes: Submit three (3) samples of surface applied polyurethane tactile mat of the kind proposed for use.

D. Shop drawings are required for products specified showing fabrication details; tile surface profile; adhesives; plans of mat placement including joints, and material to be used as well as outlining installation materials and procedure.

E. Material Test Reports: Submit test reports from qualified independent testing laboratory indicating that materials proposed for use are in compliance with requirements and meet the properties indicated.

F. Maintenance Instructions: Submit copies of manufacturer's specified maintenance practices for each type of tactile tile and accessory as required.

1.4 QUALITY ASSURANCE

A. Provide surface applied tactile mat and accessories as produced by a single manufacturer.

B. Installer's Qualifications: Engage an experienced Installer qualified for installation, who has successfully completed mat installations similar in material, design, and extent to that indicated for Project.

C. Americans with Disabilities Act (ADA): Provide tactile warning surfaces which comply with the detectable warnings on walking surfaces section of the Americans with Disabilities Act (Title 49 CFR TRANSPORTATION, Part 37.9 STANDARDS FOR ACCESSIBLE TRANSPORTATION FACILITIES, Appendix A, Section 4.29.2 DETECTABLE WARNINGS ON WALKING SURFACES.

In addition products must comply with CALIFORNIA TITLE 24, PART 2, Chapters 18, 19, 21, and 22 requirements regarding patterns, color and sound on cane contact.

D. Polyurethane tactile mat incorporating truncated domes shall conform to the following:

1. Water Absorption of mat when tested by ASTM-D 570 not to exceed 0.36%.

2. Slip Resistance of mat when tested by ASTM-C 1028 the combined wet/dry static co-efficient of friction not to be less than 0.90.

3. Tensile Strength of mat when tested by ASTM-D 412 not to be less than 1,100 psi.

4. Tear Strength of mat when tested by ASTM-D – 624-91 not to be less than 200 psi.

5. Chemical Resistance of mat when tested by ASTM-D-1038: No change.

6. Stain Resistance of mat when tested by ASTM-2299: No change.

7. Smoke Density of mat when tested to ASTM E 662: 245 (@ 4 minutes).

8. Flammability of mat when tested to ASTM E 648: 1.12 watts/ cm. sq.

9. QUV Exposure results when mat tested with “B” Bulbs for 200 hrs.: No change.

10. Freeze-Thaw Cycling when tested to ASTM 1026-84: Unaffected.

11. Hardness of mat when tested to ASTM-D-2240: 90 (Shore A).

12. Specific Gravity of mat when tested to ASTM-D-792: 1.22.

13. Weight loss of mat when tested to ASTM D-1044 (Taber Abrasion H-22 Wheel, 1000gms/1000 cycles) 150 mgs.

E. Special warnings for disabled persons shall comply with CBC Sections 1133B.8.3 and 1133B.8.4.

1.5 DELIVERY, STORAGE AND HANDLING

A. Mat and adhesive materials shall be suitably packaged or crated to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy wrappings, and shall be identified by model designation or number. Mats shall be kept dry and away from sources of heat. Store on flat level surface.

B. Mat and adhesives shall be delivered to location at building site for storage prior to installation.

1.6 SITE CONDITIONS

A. Environmental Conditions and Protection: Maintain minimum air and surface temperature of 60 degrees F and rising in spaces to receive tactile mats prior to installations, during installation, and for not less than 2 hours after installation. Store materials in spaces where they will maintain minimum temperature of 60 degrees F for at least 24 hours prior to installation.

B. Provide barricades or screens to protect passengers or public.

1.7 EXTRA STOCK

A. Deliver extra stock to the Owner. Furnish new materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identification. Furnish not less than two or (10)% of the supplied materials for each type, color and pattern installed.

1.8 WARRANTY

A. Surface applied detectable warning mat shall be warranted in writing for a period of five years from date of final completion.

PART 2 PRODUCTS

2.1 MAT MANUFACTURER

A. The polyurethane detectable warning mat specified is based on the Detectable Warning Mat manufactured Detectable Warning Systems, Inc. (866-999-7452). Existing engineered ADA and California Title 24 field tested products in service for a minimum of 2 years which are subject to compliance with requirements, may be incorporated in the work and shall meet or exceed the specified test criteria and characteristics.

1. Color: Yellow conforming to Federal Color No. 33538. Color shall be homogenous throughout the mat.

2.2 INSTALLATION MATERIALS

A. DWS # 3549, heavy-duty elastomeric two-part polyurethane ground adhesive.

B. DWS # ES10, cyanoacrylate edge sealer.

C. DWS # SS10, cyanoacrylate seam sealer.

D. DWS #NA25100Y, low profile nylon expansion anchors ¼ inch diameter by 1-inch long to be positioned in the molded recess area at the rate of 6 anchors for each 2’ x 4’ mat and 8 anchors for each 3’ x 4’ mat.

PART 3 EXECUTION

3.1 INSTALLATION

A. During all surface preparation and mat installation procedures ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.

B. The application of all adhesives, sealants and mechanical fasteners shall be in strict accordance with the guidelines set by their respective manufacturers.

C. Throughout the installation phases of surface preparation and mat setting, ensure that care is taken to prevent damage to any work.

D. Immediately prior to installing the surface applied tactile mats, all surfaces must be inspected to ensure that they are clean, dry, free of voids, curing compounds, projections, loose material, dust, oils, grease, sealers and determined to be structurally sound before the application of the setting adhesive. All new substrate concrete paving must have been cured for at least 21 days prior. If present, all concrete curing compounds shall be removed with sandblasting and cracks or holes larger than 1/8" shall be patched. The setting adhesive requires that the substrate and the ambient temperature are 60 degree F minimum and rising, and completely dry with no precipitation during 24 hours prior to installation. Assure that sprinklers or other water sources will not be turned on during the installation and adhesive curing process.

E. Cut and pre-position the mats as shown on the drawings. Inspect the mats and clean all dust and other contaminants from the surfaces to be adhered. Install duct tape to mask the substrate concrete paving, 1/8" beyond the edge of the pre-positioned mats. Set the mats in place one at a time, true and square, following the manufacturers written instructions.

F. Mix the ground adhesive according to the manufacturer's written instructions. Spread the adhesive to provide complete 100% coverage over the concrete substrate surface, using a clean, well-maintained 3/32-inch V notch trowel. Place mats tight against each other in their pre-laid positions. Press firmly from the center out to remove all air bubbles. When butting mats together, use duct tape to temporarily hold the seams tight. After the mats are in installed, remove the perimeter tape from the concrete substrate and firmly press down the corners of each mat. Then cover the mats with plywood weighted down with several 25# sand bags. Keep weighted plywood in place for several hours to insure complete bonding of the adhesive.

G. After the mats have been installed and the ground adhesive has set, nylon anchors shall be installed. Drill holes true and straight to the depth required using the recommended bit with holes located by the molded recesses area in the mats. Clean dust from the holes to provide clear passage for the anchor. Mechanically fasten mats to the floor surface using a hammer to set the impact anchors provided. Ensure the fastener has been set to full depth, straight and true. Care should be taken when setting the fastener to avoid any inadvertent blows with the hammer to the mat surface.

H. Apply a small bead of Seam Seal Adhesive along all joint seams, avoiding contact with skin.

I. Apply a small bead of Edge Sealer along all outer edges of mats, avoiding contact with skin.

J. After the mats have been fully installed, and sealer has cured, the surface shall be cleaned, following the recommended maintenance and cleaning procedures.

3.2 CLEANING AND PROTECTING

A. Protect mats against damage during construction period to comply with manufacturer's specification.

B. Protect mats against damage from rolling loads following installation by covering with plywood.

C. Clean mats by method specified by the manufacturer.

END OF SECTION

SECTION 328400

IRRIGATION

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

A. The requirements of the "General Conditions of the Contract" and of Division 1, "General Requirements", shall apply to all work of this Section with the same force and effect as though repeated in full herein.

1.2 DESCRIPTION

A. Scope of Work: Provide all labor, materials, transportation, and services necessary to furnish and install the Reclaimed Water Irrigation System as shown on the Drawings and described herein.

1.3 QUALITY ASSURANCE & REQUIREMENTS

A. Qualifications: The Contractor and its on-site job superintendent shall have regularly engaged and specialized, for the preceding five years, in the installation of irrigation systems of similar scope, size and complexity as the system being installed under this contract.

B. Permits and Fees: The Contractor shall secure the required licenses and permits, make payments of charges and fees required, give required notices to public authorities and verify permits secured or arrangements made by others affecting the work of this section.

C. Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers of articles used in this Contract furnish directions covering points not shown in the Drawings and Specifications.

D. Ordinances and Regulations:

1. Comply with all local, municipal and state laws, rules and regulations.

2. Conform to applicable provisions of the latest editions of the Uniform Plumbing Code, the National Electric Code and all codes properly governing the materials and work at the project site.

3. All City of Beverly Hills Standard Plans and Specifications for Reclaimed Water, DWP Regulations, municipal and state laws, and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these Specifications and shall apply to all work of this Section with the same force and effect as though repeated in full herein. The Contractor shall carry out their provisions. Anything contained in these Specifications shall not be construed to conflict with any of the above rules, regulations, or requirements. 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.

E. Explanation of Drawings:

1. 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 the irrigation system, planting, underground utilities, above ground utilities and architectural features.

2. All work called for on the Drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the Specifications.

3. 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 City Representative. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary.

F. Reference specification and standards:

1. ASTM: D1784 Rigid Poly (Vinyl Chloride) Compounds and Chlorinated Poly (Vinyl Chloride) Compounds.

2. ASTM: D1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and CL200.

3. ASTM: F441 Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40, 80 and CL200.

4. ASTM: D2464 Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

5. ASTM: F437 Threaded Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

6. ASTM: D2466 Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

7. ASTM: F438 Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.

8. ASTM: F2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

9. ASTM: F493 Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

10. The latest edition of the City of Beverly Hills Standard Plans and Specifications.

11. The latest edition of the regulations for the construction of irrigation water systems within the Department of Water and Power.

1.4 SUBMITTALS

A. Material List:

1. The Contractor shall furnish the articles, equipment, materials, or processes specified by name in the Drawings and Specifications. No substitution will be allowed without prior written approval by City Representative.

2. Complete material list shall be submitted prior to performing any work. Material list shall include the manufacturer, model number, and description of all materials and equipment to be used.

3. Although manufacturer and other information may be different, the following is a guide to proper submittal format:

Item	Manufacturer	Model Number	***Description***
1.	Pacific Plastics	Mainline piping per Specification	PVC Class 315 pipe for reclaimed water (purple) with solvent welded joints for sizes 2" and larger and PVC Schedule 40 pipe for reclaimed water (purple) with solvent welded for sizes 1-1/2" and smaller.
2.	Paige Electric	Irrigation Control wire	# 14 UF UL approved for control wire and # 12 UF UL approved for common wire.
3.	Nibco	T-113	T-113 with bronze cross handle - 3" and smaller.
4.	Rainbird	1806-SAM-PRS	6" pop-up spray head with Rain Bird "MPR" nozzles.
5.	Etc.	Etc.	Etc.

4. Irrigation submittal must be specific and complete with a full description of product use. All items must be listed and should include solvent/primer, wire, wire connectors, valve boxes, etc. No copies of manufacturer's literature (catalog cuts) are required as submittal information.

5. The Contractor may submit substitutions for equipment and materials listed on the Irrigation Drawings by following procedures as outlined in Section 1.06 of the Irrigation Specifications.

6. Equipment or materials installed or furnished without prior approval of Owner's Authorized Representative may be rejected and the Contractor may be required to remove such materials from the site at his own expense.

7. Approval of any item, alternative or substitute, indicates only that the product or products apparently meet the requirements of the Drawings and Specifications on the basis of the information or samples submitted.

8. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

B. Record Drawings:

1. The contractor shall update irrigation record drawings to include all irrigation changes and additions. Electronic files of previous irrigation record drawings will be provided by Owner.

2. The Contractor shall provide and keep up-to-date a complete record set of plain paper copy prints which shall be corrected daily, showing every change from the original Drawings and Specifications and the exact installed locations, sizes, and kinds of equipment. Prints for this purpose may be obtained from Owner's Authorized Representative at cost. This set of drawings shall be kept on the site and shall be used only as a record set.

3. These drawings shall also serve as work progress sheets and shall be the basis for measurement and payment for work completed. These drawings shall be available at all

times for observation and shall be kept in a location designated by Owner Authorized Representative. Should the record drawing progress sheets not be available for review or not be up-to-date at the time of any observation (refer to Section 3.10 - Site Observation Schedule), it will be assumed no work has been completed and the Contractor may be assessed by Owner the cost of that site visit at the current billing rate of City's Authorized Representative. No other observations shall take place prior to payment of that assessment.

4. The Contractor shall make neat and legible notations on the record drawing progress sheets daily as the work proceeds, showing the work as actually installed. For example, should a piece of equipment be installed in a location that does not match the plan, the Contractor must indicate that equipment has been relocated in a graphic manner so as to match the original symbols as indicated in the irrigation legend. The relocated equipment and dimensions will then be transferred to the original record drawing plan at the proper time.

5. Before start of plant establishment, the Contractor shall provide the completed irrigation red lined set of "as-built" record drawings to City Representative for review and approval. After review and approval of the red lined set of "as-built" record drawings by Owner, "as-built" information shall be transferred to AutoCad electronic drawing files. Electronic files of irrigation system will be provided by Owner. Dimensions shall be made so as to be legible even on the final controller chart. Provide AutoCAD submittal plot for Owner's review and approval prior to fabricating the controller charts. Update AutoCAD electronic files of "as-built" drawings in accord with Owner's requirements.

6. The Contractor shall be responsible for preparation of irrigation "as-built" record drawings in AutoCAD format. As an option, the Contractor may request to have the irrigation "as-built" record drawings prepared by the irrigation designer. If the Contractor elects to have the irrigation "as-built" record drawings prepared by the irrigation designer, the Contractor shall provide the irrigation designer with a copy of the redlined the irrigation "as-built" record drawings approved by Owner's Authorized Representative at start of plant establishment. The irrigation designer will transfer Contractor's redlined irrigation "as-built" record drawing information in AutoCAD format to the Contractor within 30 calendar days of the request. Failure of the Contractor to provide red lined "as-built" information to the irrigation designer at the required time could result in an extension of the plant establishment period. Extension of the plant establishment period caused by the Contractor non-performance to provide the irrigation designer with a copy of the redlined the irrigation "as-built" record drawings approved by Owner's Authorized Representative shall be at no additional cost to the Owner. The Contractor shall pay all costs involved for preparation of the irrigation "as-built" record drawings in AutoCAD format to the irrigation designer. This cost shall be included as a part of the Contractor's bid and no additional compensation shall be paid to the Contractor by Owner.

7. The Contractor shall dimension from two (2) permanent points of reference, such as building corners, sidewalk edges, road intersections, etc., the location of the following items:

    a. Connection to existing water lines.

    b. Connection to existing electrical power.

    c. Gate valves.

    d. Routing of sprinkler pressure lines (dimension max. 100' along routing and at each change of direction).

    e. Electric control valves.

f. Routing of control wiring and flow sensor cable.

g. Quick coupling valves.

h. Other related equipment as directed by City Representative.

i. Sleeves and conduits.

8. Prior to the start of maintenance, the Contractor shall deliver the corrected and completed mylars, prints and electronic files of the of irrigation “as-built” record drawings to City’s Authorized Representative. Submittal shall include one set of bond plots and one set of mylar plots along with one digital file on CD-ROM of the irrigation “as-built” record drawings in AutoCAD format and PDF format. Delivery of the mylars, prints and electronic files will not relieve the Contractor of the responsibility of furnishing required information that may be omitted from the redlined prints.

C. Controller Charts:

1. The Contractor shall include the irrigation controller charts. Electronic files of the Phase 1 irrigation controller charts will be provided by Owner.

2. Redlined As-built drawings shall be reviewed by City Representative before controller charts are prepared.

3. Provide two controller charts for each controller supplied.

4. The chart shall show the area controlled by the automatic controller and shall be 11” X 17” in size and shall be prepared in AutoCAD format in the same manner as “as-built” record drawings.

5. The chart is to be a reduced drawing of the actual installed system. However, in the event the controller sequence is not legible when the drawing is reduced, it shall be enlarged to a size that will be readable when reduced.

6. The chart shall be a plain paper copy print and a different color shall be used to indicate the area of coverage for each station.

7. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils.

8. These charts shall be completed approved and shall be turned over to Owner prior to start of landscape maintenance. Also, include one digital file on CD-ROM of the irrigation controller charts in PDF format shall be included on the record drawing CD-ROM.

D. Operation and Maintenance Manuals:

1. Prepare and deliver to City Representative within ten calendar days prior to completion of construction, two hard-cover, three-ring binders containing the following information:

a. Index sheet which states Contractor's name, address, and telephone number, and which lists each installed equipment and material item, including names and addresses of manufacturers' local representatives.

b. Guarantee statement.

2. In addition to the above-mentioned maintenance manuals, provide Owner's maintenance personnel with instructions for major equipment and show evidence in writing to City Representative prior to start of landscape maintenance that this service has been rendered.

E. Equipment to be Furnished:

1. Supply as a part of this contract the following:

a. Operation and maintenance manuals.
b. Color-coded controller charts laminated between 2 pieces of 20 mil plastic – Provide two charts for each controller.
c. "As-built" record drawing mylars of irrigation plans.
d. Completed Irrigation Guarantee Statement.
e. Acceptance document to be signed by City's Representative.

2. The above-mentioned equipment shall be turned over to Owner prior to start of landscape maintenance. Before landscape maintenance and final observation to start can occur, evidence that Owner has received these items must be shown to city's Representative. Refer to "TURNOVER, AND ACCEPTANCE FORM" portion of these specifications for additional information.

F. Checklist:

1. Provide Owner with the following checklist information at the end of each segment of the project. This checklist shall be completed prior to start of maintenance.

a. Plumbing permits obtained: If none required, so state.
b. Material approvals. By whom approved and date.
c. Pressure line tests: By whom approved and date.
d. Manufacturer's warranties, if required: Recipient and date.
e. Written guarantee: Recipient and date.
f. Install anti-drain valve protection as required to prevent low head drainage.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Handling of PVC Pipe and Fittings: The Contractor is cautioned to exercise care in handling, loading, unloading, and storing PVC pipe and fittings. All PVC pipe shall be transported in a vehicle, which allows the length of pipe to lie flat so as not to subject it to undue bending or a concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded, and if installed, shall be replaced with new piping.

1.6 QUALIFICATION OF IRRIGATION PERSONNEL

A. Contractor and on site field superintendent shall have the following minimum qualifications:

1. Not less than five years continuous experience in installation of commercial irrigation systems.

2. Demonstrate completion of the manufacturer's installation certification program for the weather based control system.

3. Upon Owner's request, supply a list of references listing successfully completed commercial irrigation systems.

1.7 SUBSTITUTIONS

A. If the Contractor wishes to substitute any equipment or materials for the equipment or materials listed on the Drawings and Specifications, he may do so by providing the following information to City's Representative for review:

1. Provide a statement indicating the reason for making the substitution. Refer to Section 012500-Substitution Procedures.

2. Provide descriptive catalog literature, performance charts and flow charts for each item to be substituted.

3. Provide the amount of cost savings if the substituted item is approved.

B. City's Representative shall have the sole responsibility in accepting or rejecting any substituted item as an approved equal to the equipment and materials listed on the Drawings and Specifications.

1.8 GUARANTEE

A. The guarantee for the irrigation system shall be made in accordance with the attached form. The General Conditions and Supplementary Conditions of these Specifications shall be filed with Owner prior to acceptance of the irrigation system.

B. A copy of the guarantee form shall be included in the operations and maintenance manual.

C. The guarantee form shall be re-typed onto the Contractor's letterhead and shall contain the following information:

GUARANTEE FOR IRRIGATION SYSTEM

We hereby guarantee that the 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, unusual abuse, or neglect accepted. We agree to repair or replace any defects in material or workmanship which may develop during the period of one year from date of acceptance and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional costs to Owner. We shall make such repairs or replacements within a reasonable time, as determined by Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from Owner, we authorize 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: _____

SIGNED BY: _____
CONTRACTORS ADDRESS: _____
CONTRACTOR'S PHONE NO.: _____

DATE OF ACCEPTANCE: _____

1.9 Turnover to Owner

The following checklist, turnover and acceptance forms shall be re-typed onto the Contractor's letterhead. The form shall be completed by the contractor and shall contain the all of the information shown on this sample checklist form and turned over to Owner prior to start of maintenance:

TURNOVER, AND ACCEPTANCE FORM

PROJECT NAME: _____

PROJECT LOCATION: _____

TURNOVER ITEMS:

- ☐ Operation and maintenance manuals.
- ☐ Color-coded controller charts laminated between 2 pieces of 20 mil plastic – Provide two charts for each controller.
- ☐ "As-built" record drawing mylars of irrigation plans.
- ☐ Completed Irrigation Guarantee Statement.

DELIVERED BY:	ACCEPTED BY:
_____	
Name of Contractor	
_____	_____
Name of contractor's authorized representative	Name authorized representative
_____	_____
Signature contractor's authorized representative	Signature authorized representative
_____	_____
Date of deliverance	Date of acceptance

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Use only new materials of brands and types noted on drawings, specified herein, or approved equals.

B. PVC Pressure Main Line Pipe and Fittings: Use Purple Pipe for irrigation systems (Reclaimed Water)

1. Pressure main line piping for sizes 2" and larger shall be PVC Class 315.

2. Class 315 pipe shall be made from an NSF approved Type I, Grade I, PVC compound conforming to ASTM resin specification D1784. All pipe must meet requirements as set forth in Federal Specification PS-22-70, with an appropriate standard dimension (S.D.R.) (Solvent-weld Pipe).

3. Pressure main line piping for sizes 1-1/2" and smaller shall be PVC Schedule 40 with solvent welded joints.

4. Schedule 40 pipe shall be made from NSF approved Type I, Grade I PVC compound conforming to ASTM resin specification D1785. All pipe must meet requirements as set forth in Federal Specification PS-21-70.

5. PVC solvent-weld fittings for pressure main line piping shall be Schedule 80, 1-2, II-I NSF approved conforming to ASTM test procedure D2466.

6. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type and installation methods prescribed by the manufacturer.

7. All PVC pipe must bear the following markings:

a. Manufacturer's name
b. Nominal pipe size
c. Schedule or class
d. Pressure rating in P.S.I.
e. NSF (National Sanitation Foundation) approval
f. Date of extrusion
g. Purple piping for Reclaimed water.

8. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable I.P.S. schedule and NSF seal of approval.

C. PVC Non-Pressure Lateral Line Pipe and Fittings: Use Purple Pipe for irrigation system carrying recycled water.

1. Non-pressure buried lateral line piping shall be PVC Schedule 40 with solvent-weld joints

2. PVC solvent-weld fittings for pressure main line piping shall be Schedule 40, 1-2, II-I NSF approved conforming to ASTM test procedure D2466.

3. Schedule 40 pipe shall be made from NSF approved Type I, Grade I PVC compound conforming to ASTM resin specification D1785. All pipe must meet requirements as set forth in Federal Specification PS-21-70.

4. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type and installation methods prescribed by the manufacturer.

5. All PVC pipe must bear the following markings:

   a. Manufacturer's name
   b. Nominal pipe size
   c. Schedule or class
   d. Pressure rating in P.S.I.
   e. NSF (National Sanitation Foundation) approval
   f. Date of extrusion
   g. Purple piping for Reclaimed water

6. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable I.P.S. schedule and NSF seal of approval.

D. Brass Pipe and Fittings:

1. Where indicated on the Drawings, use red brass screwed pipe conforming to Federal Specification #WW-P-351.

2. Fittings shall be red brass conforming to Federal Specification #WW-P-460.

E. Gate Valve:

1. Valves 3 inches and smaller shall be ASTM B 62 brass body, 150 pound saturated steam rated with screwed joints, non-rising stem, screwed bonnet, and solid disc, unless otherwise noted on drawings. Provide with hand wheel.

I. Quick Coupling Valve:

1. Where indicated on the drawings, valves shall have brass body, 150 pound class, with 3/4 inch female threads opening at base permitting operation with a special connecting device (coupler) designed for this purpose.

2. Coupler threads shall be lug type.

3. Provide with purple rubber-like vinyl hinge cover.

J. Backflow Prevention Unit:

1. Backflow prevention unit is existing. Protect in place.

I. Master Valve

1. Valve shall be spring-loaded, packless diaphragm activated, normally open type with brass body, equipped with flow control and pressure regulation capabilities when noted on drawing.

2. Valve solenoid shall be 24 volt a.c. 4.5 watt maximum, 500 mili-amp maximum surge, corrosion-proof, stainless steel construction, epoxy encapsulated to form a single integral unit.

3. Provide bleeder valve to permit operation in the field without power at the controller.

K. Check Valve:

1. Swing check valves 2" and smaller shall be 200 pound W.O.G. bronze construction with replaceable composition, neoprene, or rubber disc and shall meet or exceed Federal Specification WW-V-51D, Class A, Type IV.

2. Anti-drain valves shall be of heavy duty virgin PVC construction with F.I.P. thread inlet and outlet. Internal parts shall be stainless steel and neoprene. Anti-drain valve shall be field adjustable against drawout from 4 to 32 feet of head. Anti-drain valve shall be similar to the Hunter HCV or approved equal.

L. Control Wiring:

1. Wire requirements are as follows:

a. Unless otherwise noted, connections between an automatic controller and its corresponding electric control valves shall be made with direct burial copper wire AWG-U.F. 600 volt.

b. When more than one controller is installed at the same location, pilot wires shall be a different color wire for each automatic controller. Common wires shall be white with a different color stripe for each automatic controller.

c. Install in accordance with valve manufacturer's specifications and wire chart. In no case shall wire size be less than #14.

2. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.

3. Where more than one (1) wire is placed in a trench, the wiring shall be taped together at intervals of ten (10) feet.

4. An expansion curl shall be provided within three (3) feet of each wire connection. Expansion curl shall be of sufficient length at each splice connection at each electric control valve, so that in case of repair, the valve bonnet may be brought to the surface without disconnecting the control wires. Control wires shall be laid loosely in trench without stress or stretching wire conductors.

5. All control wire connection splices shall be made with 3M "DBY-6" direct bury splice kits or approved equal. Make only one splice with each splice kit.

6. Field splices between the automatic controller and electric control valves will not be allowed without prior approval of City’s Representative.

M. Irrigation Controller:

O. Electric Control Valve:

1. All electric control valves shall be the same size and type shown on the Drawings.

2. All electric control valves shall have a manual flow adjustment.

3. Provide and install one control valve box for each electric control valve.

P. Valve Box:

1. All valve boxes shall be purple in color.

2. Use 10" x 10-1/4" round box for all gate valves, Carson Industries #910-12B with purple bolt-down cover or approved equal. Extension sleeve shall be PVC with minimum size of six (6) inches.

3. Use 9-1/2" x 16" x 11" rectangular box for all electric control valves, Carson Industries #1419-12B with purple bolt-down cover or approved equal.

4. Use 10" diameter x 10-1/4" deep round plastic valve box for all quick coupling valves, Carson Industries #910-12B with purple bolt-down cover or approved equal.

Q. Sprinkler Head:

1. All sprinkler heads shall be of the same size, type, and deliver the same rate of precipitation with the diameter (or radius) of throw, pressure, and discharge as shown on the Drawings and/or as specified herein. Caps for sprinkler heads shall be purple (Reclaimed Water).

2. Spray heads shall have a screw adjustment.

3. Riser units shall be fabricated in accordance with the installation details.

4. Riser nipples for all sprinkler heads shall be the same size as the riser opening in the sprinkler body.

5. All sprinkler heads of the same type shall be by the same manufacturer.

R. Identification Tag:

1. I.D. tags for electric control valves shall be manufactured from Polyurethane Behr Desopan. Use Christy's standard tag hot-stamped with black letters on purple background. Tags shall be numbered to match programming shown on the Drawings. Provide one tag for each electric control valve.

2. I.D. tags for quick coupling valves shall be manufactured from Polyurethane Behr Desopan. Use Christy's maxi tag, hot-stamped with black letters on purple background. Tags shall read "Warning - Unsafe Water - Do Not Drink." Tag shall be printed in English on one side and Spanish on the other. Provide one tag for each quick coupling valve.

3. Special order tags from T. Christy Enterprises, 655 East Ball Road, Anaheim, CA 92805. Phone (714) 507-3300 and Fax (714) 507-3310.

S. Flow sensor and flow transmitter.

1. Data Industries IR Series, or equal.

T. Flow Sensor Cable and Conduit:

1. Cabling required for connections from controller to flow sensor shall be installed in conduit: Rain Master E.V Cable, or equal.

W. Miscellaneous Irrigation Equipment:

1. Refer to the Drawings for sizes and types of miscellaneous irrigation equipment.

2. All miscellaneous irrigation equipment shall be as specified or approved equal.

3. Warning tape indicating reclaimed water lines.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Before work is commenced, hold a conference with Owner, General Contractor, irrigation contractor and Landscape Architect to discuss general details of the work.

B. Verify dimensions and grades at job site before work is commenced.

C. During the progress of the work, a competent superintendent and any assistants necessary shall be on site, all satisfactory to Owner. The superintendent shall not be changed, except with consent of Owner, unless that person proves unsatisfactory and ceases to be employed. The superintendent shall represent Contractor in its absence and all directions given to the superintendent shall be as binding as if given to Contractor.

D. All work indicated or noted on Drawings shall be provided whether or not specifically mentioned in the Specifications.

E. If there are ambiguities between Drawings and Specifications, and specific interpretation or clarification is not issued prior to bidding, the interpretation or clarification will be made only by Owner, and Contractor shall comply with the decisions. In the event the installation contradicts the directions given, the installation shall be corrected by Contractor at no additional cost to Owner.

F. Layout of sprinkler lines shown on Drawings is diagrammatic only. Location of sprinkler equipment is contingent upon and subject to integration with all other underground utilities. Contractor shall employ all data contained in the Contract Documents and shall verify this information at the construction site to confirm the manner by which it relates to the installation.

G. Coordinate the installation of all sprinkler materials, including pipe, with the landscape Drawings to avoid conflict with the trees, shrubs, or other planting.

H. Do not proceed with the installation of the sprinkler system when it is apparent that obstructions or grade differences exist or if conflicts in construction details, legend, or specific notes are discovered. All such obstructions, conflicts, or discrepancies shall be brought to the attention of Owner.

I. Replace, or repair to the satisfaction of Owner, all existing paving disturbed during the course of this work. New paving shall be the same type, strength, texture, finish, and be equal in every way to the material removed.

J. The Owner reserves the right to make temporary repairs as necessary to keep equipment in operating condition without voiding Contractor's guarantee or relieving Contractor of its responsibilities during the guarantee shall not be allowed.

K. All sprinkler heads will require installation of anti-drain devices to prevent low head drainage.

L. Coordinate the installation of all sprinkler materials, including pipe, with the landscape Drawings to avoid conflict with the trees, or other planting.

3.2 OBSERVATION OF SITE CONDITIONS

A. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and receive approval from City's Representative prior to proceeding with work under this Section.

B. Exercise extreme care in excavating and working near existing utilities. The Contractor shall be responsible for damages to utilities, which are caused by his operations or neglect. Check existing utilities drawings for existing utility locations.

C. Coordinate installation of sprinkler irrigation materials including pipe, so there shall be NO interference with utilities or other construction or difficulty in planting trees, shrubs, and ground covers.

D. The Contractor shall carefully check all grades to satisfy itself that he may safely proceed before starting work on the irrigation system.

3.3 PREPARATION

A. Physical Layout:

1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads.

2. All layouts shall be reviewed by Landscape Architect and City Representative prior to installation.

B. Water Supply:

1. The irrigation system shall be connected to water supply point(s) of connection as indicated on the Drawings.

2. Connections shall be made at the approximate location(s) shown on the Drawings. The Contractor is responsible for minor changes caused by actual site conditions.

C. Electrical Supply:

1. Electrical connections for any and all automatic controllers shall be made to electrical point(s) of connection as indicated on the Drawings.

2. Connections shall be made at the approximate location(s) shown on the Drawings. The Contractor is responsible for minor changes caused by actual site conditions.

3.4 INSTALLATION

A. Trenching:

1. Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on the Drawings and as noted.

2. Provide for a minimum of eighteen (18) inches cover for all pressure supply lines of 2 1/2-inch nominal diameter or smaller.

3. Provide for a minimum of twenty-four (24) inches cover for all pressure supply lines of 3-inch nominal diameter or larger.

4. Provide for a minimum of twelve (12) inches for all non-pressure lines.

5. Provide for a minimum cover of twenty-four (24) inches for all control wiring.

6. Provide for a minimum cover of eighteen (18) inches for all communication cable conduits.

7. Warning rape identifying reclaimed water line shall be installed above the pressure supply lines.

B. Backfilling:

1. The trenches shall not be backfilled until all required tests are performed. Trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, free from large clods of earth or stones. Backfill shall be mechanically compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.

2. A fine granular material backfill will be initially placed on all lines. No foreign matter larger than one-half (1/2) inch in size will be permitted in the initial backfill.

3. Flooding of trenches will be permitted only with written approval of City's Representative.

4. If settlement occurs and necessitates adjustments in pipe, valves, sprinkler heads, lawn, plantings, or other installed work, the Contractor shall make all required adjustments without cost to Owner.

C. Trenching and Backfill Under Paving:

1. Trenches located under areas where paving, asphaltic concrete, or concrete will be installed, shall be backfilled with sand (a layer six [6] inches below the pipe and three [3] inches above the pipe) and compacted in layers to 95% compaction, using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm unyielding condition. All trenches shall be left flush with the adjoining grade. The Contractor shall set in place; cap and pressure test all piping under paving prior to the paving work.

2. Generally, piping under existing walks is done by jacking, boring, or hydraulic driving, but where any cutting or breaking of sidewalks and/or concrete is necessary, it shall be done and replaced by the Contractor as a part of the Contract cost. Permission to cut or break sidewalks and/or concrete shall be obtained from City's Representative. No hydraulic driving will be permitted under concrete paving or asphalt paving.

3. Provide for a minimum cover of eighteen (18) inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete paving.

D. Plastic Pipe:

1. Install plastic pipe in accord with manufacturer's recommendations.

2. Install sprinkler head on plastic pipe as indicated on Drawings.

3. Prepare all welded joints with manufacturer's primer prior to applying solvent.

   a. Allow welded joints at least 15 minutes set-up/curing time before moving or handling.
   b. Partially center load pipe in trenches to prevent arching and shifting when water

pressure is on.

c. Do not permit water in pipe until a period of at least four hours has elapsed for solvent weld setting and curing, unless recommended otherwise by solvent manufacturer.

4. Attach pipe identification tape directly to pipe as specified in Section 02601, where color-impregnated and stenciled pipe is not utilized.

5. Do backfilling when pipe is cool.

a. Pipe can be cooled by operating the system for a short time before backfill, or by backfilling in the early part of the morning before the heat of the day.

6. Curing:

a. When the temperature is above 80°F., allow soluble weld joints at least 24 hours during the time before water is introduced under pressure.

b. When temperature is below 80°F., follow manufacturer's recommendations.

E. Assemblies:

1. Routing of sprinkler irrigation lines as indicated on the Drawings is diagrammatic. Install lines (and various assemblies) in such a manner as to conform to the details per the Drawings.

2. Install NO multiple assemblies in plastic lines. Provide each assembly with its own outlet.

3. Install all assemblies specified herein in accordance with respective detail. In absence of detail drawings or Specifications pertaining to specific items required to complete work, perform such work in accordance with best standard practice with prior approval of City's Representative.

4. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust, and moisture before installation. Installation and solvent welding methods shall be as recommended by the pipe and fitting manufacturer.

5. On PVC to metal connections, the Contractor shall work the metal connections first. Teflon tape or approved equal, shall be used on all threaded PVC to PVC, and on all threaded PVC to metal joints. Light wrench pressure is all that is required. Where threaded PVC connections are required, use threaded PVC adapters into which the pipe may be welded.

F. Conduit and Sleeves:

1. Coordination: Sleeving shall be considered existing only when installed under another contract. For all other installations, provide materials and coordinate conduit and sleeve installation with other trades as required to facilitate smooth construction sequence.

2. Conduit: Furnish and install conduit where control wires pass under or through walls, walks and paving. Conduits to be of adequate size to accommodate retrieval for repair of wiring and shall extend 12 inches beyond edges of walls and pavement.

3. Sleeving: Install sleeves for all pipes passing through or under walks and paving as shown on the Drawings. Sleeving to be of adequate size to accommodate retrieval of wiring or piping for repair and shall extend 12 inches beyond edges of paving or other construction.

G. Line Clearance:

1. All lines shall have a minimum clearance of six (6) inches from each other and from lines of other trades. Parallel lines shall not be installed directly over one another.

H. Automatic Controller Assembly:

1. Electric control valves shall be connected to the existing automatic controller in numerical sequence as shown on the Drawings.

2. After the plant establishment period and acceptance of the landscape and irrigation by the City's Representative, the contractor shall change the irrigation controller from the plant establishment schedule and program to the full automated irrigation setup, schedule and program shown on the irrigation plans and entered into the irrigation controller.

J. Electric Control Valves:

1. Install each electric control valve in a separate valve box.

2. Install where shown on the Drawings. Where grouped together, allow at least twelve (12) inches between adjacent valve boxes.

3. Each valve number shall be heat branded on purple (reclaimed water) valve box lid with 1½" tall letters. Branding unit available from valve number shall be heat branded on valve box lid with 1½" tall letters. Branding unit is available from Hydroscape Products, Inc., phone number (714) 639-1850.

K. Flushing of System:

1. After all new sprinkler pipelines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and full head of water used to flush out the system.

2. Sprinkler heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of City's Representative.

L. Sprinkler Heads:

1. Install the sprinkler heads as designated on the Drawings. Sprinkler heads to be installed in this work shall be equivalent in all respects to those itemized.

2. Spacing of heads shall not exceed the maximum indicated on the Drawings. In no case shall the spacing exceed the maximum recommended by the manufacturer.

3. All sprinkler heads shall be set perpendicular to finish grade of the area to be irrigated unless otherwise designated on the plans.

3.5 TEMPORARY REPAIRS

Owner reserves the right to make temporary repairs as necessary to keep the irrigation system equipment in operating condition. The exercise of this right by Owner shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.

3.6 EXISTING TREES

Where it is necessary to excavate adjacent to existing trees, the Contractor shall use all possible

care to avoid injury to trees and tree roots. Excavation in areas where two (2) inch and larger roots occur shall be done by hand under the supervision of a California Certified Arborist and City Representative. All roots two (2) inches and larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped with burlap to prevent scarring or excessive drying. Where a ditching machine is run close to trees having roots smaller than two (2) inches in diameter, the wall of the trench adjacent to the tree shall be hand trimmed, making clean cuts through. Roots one (1) inch and larger in diameter shall be painted with two coats of Tree Seal, or equal. Trenches adjacent to tree should be closed within twenty-four (24) hours; and where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with burlap or canvas.

3.7 FIELD QUALITY CONTROL

A. Adjustment of the System:

1. The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible.

2. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required.

3. Lowering raised sprinkler heads by the Contractor shall be accomplished within ten (10) days after notification by Owner.

4. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the Drawings.

B. Testing of the Irrigation System:

1. The Contractor shall request the presence of City's Representative in writing at least 48 hours in advance of testing.

2. Test all new pressure lines under hydrostatic pressure of 150 pounds per square inch and prove watertight. Pipe shall be center loaded with all pipe joints exposed during the pressure test.

   Note: Testing of pressure main lines shall occur prior to installation of the electric control valves.

3. All piping under paved areas shall be tested under hydrostatic pressure of 150 pounds per square inch and proven watertight prior to paving.

4. Sustain pressure in lines for not less than two (2) hours. If leaks develop, replace joints and repeat test until entire system is proven watertight.

5. All hydrostatic tests shall be made only in the presence of Landscape Architect. No pipe shall be backfilled until it has been observed, tested, and approved in writing.

6. Furnish necessary force pump and all other test equipment.

7. When the irrigation system is completed, perform a coverage test in the presence of City's Representative to determine if the water coverage for planting areas is complete and adequate. The coverage test shall be accomplished using a contractor furnished radio remote receiver and transmitter to turn each control valve on to observe sprinkler coverage and then to turn the control valve off when coverage test of that system is complete.

Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the Drawings, 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 City's Representative. This test shall be accomplished before any ground cover is planted.

8. Upon completion, the entire system shall be tested and adjusted to meet site requirements. The contractor shall provide an irrigation water schedule for plant establishment as well as any subsequent schedule changes for review and approval by owner. Approval of irrigation schedule indicates only that the schedule submitted apparently meet the scheduling requirements of plant materials on the basis of the information submitted. Any adjustments to the schedule based on plants actual water needs or changes in weather conditions shall be the responsibility of the contractor.

3.8 MAINTENANCE

A. The entire irrigation system shall be under full automatic operation for a period of seven (7) days prior to any planting.

B. City's Representative reserves the right to waive or shorten the operation period.

3.09 CLEAN-UP

A. Clean up shall be made as each portion of work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed or washed down, and any damage occurring to the work of others shall be repaired to original conditions.

3.10 FINAL SITE OBSERVATION PRIOR TO ACCEPTANCE

A. The Contractor shall operate each system in its entirety for City's Representative at time of final observation. Any items deemed not acceptable by City's Representative shall be reworked to the complete satisfaction of City's Representative.

B. The Contractor shall show evidence to City's Representative that Owner has received all accessories, controller charts, record drawings, maintenance manuals, and equipment as required before final site observation can occur.

3.11 SITE OBSERVATION SCHEDULE

A. The Contractor shall be responsible for notifying City's Representative in advance for the following observation meetings, according to the time indicated:

1. Pre-Job Conference - 7 days
2. Pressure supply line installation and testing - 48 hours
3. Automatic controller installation - 48 hours
4. Automatic controller activation and scheduling - 48 hours
5. Control wire installation - 48 hours
6. Lateral line and sprinkler installation - 48 hours
7. Point of connection installation – 48 hours
8. Master Valve, strainer and flow sensor installation.- 48 hours
9. Flow sensor conduit installation.-48 hours
7. Coverage test - 48 hours
8. Final site observation - 7 days

B. When site observations have been conducted by a party other than City's Representative, show evidence in writing of when and by whom these observations were made.

C. Prior to walking irrigation system with City's Representative, the Contractor shall pre-walk irrigation system with its own crew to ensure compliance with plans and specifications. The Contractor shall observe those items shown on the construction observation check list below and initial and date that the all items observed are in accordance with plans and specifications. This list shall be presented to City's Representative prior to the final irrigation walkthrough with City's Representative.

D. No site observations will commence without record drawings or "Construction Observation Check List". In the event the Contractor calls for a site visit without record drawings or "Construction Observation Check List", without completing previously noted corrections, or without preparing the system for said visit, it shall be responsible for reimbursing Landscape Architect at his/her current hourly billing rate, portal to portal (plus transportation costs), for the inconvenience. No further site observations will be scheduled until this charge has been paid and received.

E. The following checklist and acceptance form shall be re-typed onto the Contractor's letterhead. The form shall be completed by the contractor and shall contain the all of the information shown on the sample checklist form shown on the next page.

CONSTRUCTION OBSERVATION CHECK LIST

PROJECT NAME: _____

PROJECT LOCATION: _____

DESCRIPTION: Sprinkler Heads	**Completed by Contractor**	**Date**	**Approved by CLIENT**	**Date**
Heads plumb and straight				
Spacing per design intent				
Correct nozzles used				
Pressure set appropriately				
PCS Screens installed				
N.P. Caps (when required)				
Heads at correct height				
Back-up heads properly located				
Turn down screws used only for minor adjustments only				
Nozzles are clean and unobstructed				
Pop-up heads retracting properly				
Heads adjacent to building/paving located correctly				
Head to head coverage ok				

Minimal overspray				
Swing joints installed				
No leaks observed				
Systems on slopes separated correctly				
Direction of spray appropriate				
No low head drainage				
Rotor are rotating				
Install van nozzles where necessary				
Proper arc patterns installed				

DESCRIPTION:	**Completed by**		**Approved by**	
Valves – All sizes and types	**Contractor**	**Date**	**CLIENT**	**Date**
Correct size of boxes				
Correct color of boxes				
Heat branding complete				
Reclaimed water designation on valves and boxes				
Height of valves in boxes				
Gravel in boxes (2cu. ft.) installed				
Brick supports in boxes installed				
Valve I.D. tags installed				
Pressure setting on valve set properly				
Bolt downs on boxes provided				
PVC sleeve in box at gate valve				
Proper wire connectors installed				
No leaks observed				
Correct clearance from valve to gravel provided				
Brass handwheel installed				
2” operating nuts installed				

Irrigation Controllers				
Proper gauge and color of control and common wires.				

Additional Items				
Coverage test complete				

END OF SECTION 328400

SECTION 329113

SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. General: Preserve and Stockpile Existing Topsoil, Provide and Place Planting Soils and Planting Soil Amendments in accordance with Contract Documents

B. Related Work Specified Elsewhere:

1. Grading - Refer to Drawings
2. Section 328000 Irrigation
3. Section 329100 Planting

C. Summary of Work: This Section includes the following:

1. Harvesting Soil from Site In-Situ or Stockpiling of top 2-4 feet for Reuse as Planting Soil Base Component to be Amended.
2. Importing of Harvested Soil from off-site if required.
3. Planting Soil Testing to determine Amendment Requirements.
4. Planting Soil Placement and Amendment Procedures.
5. Planting Soil Drainage Improvements.

1.2 REFERENCES

A. Except as modified by governing codes and by the Contract Documents, comply with the applicable ASTM or USDA provisions and recommendations.

B. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendation or suggestion shall be deemed to be mandatory under this Contract.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements

1. Provide Planting Soils, to be hand-tamped or compacted to firm the soil and to prevent subsidence but not to exceed 80% compaction of maximum dry weight, Proctor Scale.

1.4 SUBMITTALS

A. Product Data:

1. Submit to Construction Manager with copies for Landscape Architect and Soil Scientist technical data for each manufactured or packaged product of this section. Include manufacturer's product testing and analysis, and installation instructions for manufactured or processed items or materials.

2. Submit to Construction Manager with copies for Landscape Architect and Soil Scientist locations of soil material sources.

B. Certificates:

1. Submit to Construction Manager with copies for Landscape Architect and Soil Scientist certified analysis for each treatment, amendment, and fertilizer material specified and as used. Include guaranteed analysis and weight for packaged material.

2. Prior to job acceptance submit to Construction Manager with copies for Landscape Architect and Soil Scientist written certificates for the following total quantities by weight as used on Project Site for Project materials:

a. Quantity and type of commercial fertilizer, organic fertilizer, or organic amendment.

b. Quantity and type of additional soil amendments

C. Soil Analysis:

1. Unless otherwise directed soil analysis shall be done by Garn Wallace, Soils Scientist, Wallace Labs, 365 Coral Circle, El Segundo, California 90245, 310-615-0116 SOIL SCIENTIST). Contractor shall provide samples for testing as directed by Wallace Labs.

2. Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter; gradation of silt, clay and sand content; cation exchange capacity; deleterious material; pH, mineral and plant-nutrient content of topsoil or soil mix.

3. Report suitability of topsoil or soil mix for growth of applicable planting material. State recommended quantities of nitrogen, phosphorus, and potash nutrients and any limestone, aluminum sulfate, or other soil amendments to be added to produce a satisfactory topsoil or soil mix.

4. Construction Manager, Landscape Architect and Soil Scientist reserve the right to require additional soil analysis at any time such additional samples of materials are deemed necessary for verification of conformance to specification requirements. Contractor shall furnish samples for this purpose upon request and shall perform testing as requested.

D. Test Reports: Submit to Construction Manager with copies for Landscape Architect and Soil Scientist written report of each sample tested. Testing Laboratory and specific tests must be approved by Landscape Architect. Soil tests must be unique and individual to each sample taken and are not to be resubmitted or reused. Samples and analysis must be submitted within 7 calendar days of sampling. Soils Testing shall consists of the minimum following:

1. "Complete Standard Analysis" reports of imported soils base materials.
2. Soil Fertility Composition and Bulk Density Test Reports of soil base material to be used for "structural soil planting mix".
3. Each report shall include the following as a minimum and such other information required specific to material tested. Test Reports:

a. Date issued.

b. Project Title and names of Contractor and material supplier.
c. Testing laboratory name, address, and telephone number, and name(s), as applicable, of each field and laboratory inspector.
d. Date, place, and time of sampling or test, with a record of temperature and weather conditions.
e. Location of material source.
f. Type(s) of test
g. Results of tests including identification of deviations from acceptable ranges.

E. Samples:

1. Top Soil each source, 1 lb. package
2. Organic Compost: 1 lb package
3. Other Required amendments
4. Complete Soil Mix, 1 lb. package
5. Mulch Material: 1 lb package

F. Soil Blending Procedures:

1. Contractor shall submit a detailed soil blending operations plan. To the degree possible, soils shall be amended in place.

G. Purchase Documentation:

1. Top Soil Purchase and Delivery Invoices
3. Fertilizer and Chemical Amendments Purchase and Delivery Invoices.
4. Organic Compost Purchase and Delivery Invoices.

H. Settlement Mock-Up: Mock-up areas of backfill at the specified depths and apply irrigation to induce settlement, if required to help determine the amount of settlement which will be caused by irrigation and rain.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed soil work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.

B. Installer Field Supervision: Require installer to maintain full-time supervisor during times soil work is in progress.

C. Soil Testing Agency Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and specializes in types of tests to be performed, or a member of the Council on Soil Testing and Plant Analysis and has staff members with extensive agricultural research experience as demonstrated with peer reviewed publications.

D. Applicable Laws: Meet requirements of applicable laws, codes, and regulations required by authorities having jurisdiction over Work.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at Project Site.

B. Stockpiling: Soil, mulch, or amendment materials, stored on Project Site temporarily in stockpiles prior to placement shall be protected from intrusion of contaminants and erosion. Soil materials shall be covered with a tarpaulin until time of actual use. All stockpiled materials shall be placed on tarpaulin, heavy polyethylene sheeting or other suitable barrier to protect paving surfaces from staining or soiling by stockpiled materials.

1.7 PROJECT CONDITIONS

A. Utilities: Determine location of planting area utilities including lighting, irrigation and drainage; and perform work in a manner, which will avoid damage. Hand excavate, as required.

B. Waterproofing: Perform work in a manner, which will avoid damage to planter waterproofing membrane, protection board or other structural sealing materials.

C. Lifting: The Contractor shall be responsible for lifting and placing planting soils and other required material through exterior means or lifts, as approved by the Construction Manager and Landscape Architect.

D. Construction Sequencing: Soil Planting Mix shall be installed prior to any adjacent concrete, pavements, or concrete base slab or header cradle installation, which require the support of the structural soil.

E. Environmental Requirements for Soils:

1. Perform both off-site and on-site soil work only during suitable weather conditions. Do not work soil when frozen, excessively wet, excessively dry, or in otherwise unsatisfactory condition. Do not work soil when moisture is so great that excessive compaction will occur, nor when it is so dry that dust will form in the air or that clods will not break readily.

2. Apply water, if necessary, to bring soil to an optimum moisture content for tilling and placement.

3. Do not apply chemicals if wind conditions will cause hazardous drift to people or property.

F. Protection of Amended Soil and Suitable Harvested Soils:

1. Protect amended soils and suitable harvested soils from contamination such as fuels, paints, welding, concrete washing, compaction, acid washings, etc. Correct any damage to soils or plants at no cost to the owner.

PART 2 - PRODUCTS

2.1 GENERAL

A. All soil planting mix materials shall fulfill the requirements as specified.

B. Samples of individual components of planting soil and amendments in addition to blended planting soil mixes including mulch materials shall be submitted by the Contractor for

testing and analysis to the approved testing laboratory. Comply with specific material requirements specified.

1. No base component material for plant mix shall be used until certified test reports by an agricultural chemist have been received and approved by the Landscape Architect and Soil Scientist.

2. As necessary, make any and all soil mix amendments and resubmit test reports indicating amendments until approved.

C. Landscape Architect and Soil Scientist may request additional testing by Contractor for confirmation of mix quality and / or soil mix amendments at any time until completion.

2.2 SOIL MATERIALS AND PRODUCTS

A. Soil Base Component: Base Soil Material shall be Harvested Soil from the site either in situ or stockpiled. If insufficient quantities of approved Base Soil Material exist on the Project Site, Base Soil Material shall be Imported Harvested Soil from off-site local source as approved by Landscape Architect or Soil Scientist. Base Soil Material from offsite shall follow the same testing procedures for acceptance as on-site material.

1. Soil acceptance criteria for soil harvesting:

General – harvested soil shall be free of roots, clods, stones larger than 1-inch in the greatest dimension, pockets of coarse sand, noxious weeds, sticks, lumber, hazardous material, brush and other litter. It shall not be infested with nematodes or other undesirable disease-causing organisms such as insects and plant pathogens.

Topsoil shall be friable and have sufficient structure in order to give good tilth and aeration to the soil. Soil shall have a field capacity of at least 15 percent on a dry weight basis.

Gradation limits - soil shall be a sandy loam or loam. The definition of soil texture shall be the USDA classification scheme. Gravel over ¼1/2-inch in diameter shall be less than 10% by weight.

Permeability Rate - Hydraulic conductivity rate shall be not less than one inch per hour nor more than 20 inches per hour when tested in accordance with the USDA Handbook Number 60, method 34b or other approved methods.

Fertility - The range of the essential elemental concentration in soil shall be as follows:

	Ammonium Bicarbonate/DTPA Extraction parts per million (mg/kilogram dry weight basis
phosphorus	2 - 40
potassium	40 - 220
iron	2 - 35
manganese	0.3 - 6
zinc	0.6 - 8
copper	0.1 - 5
boron	0.2 - 1
magnesium	50 - 150
sodium	0 - 100
sulfur	25 - 500
molybdenum	0.1 - 2

Harvested soil may need to be amended and conditioned to optimize plant growth.

Acidity - The soil pH range measured in the saturation extract (Method 21a, USDA Handbook Number 60) shall be 6.0 - 7.9.

Salinity - The salinity range measured in the saturation extract (Method 3a, USDA Handbook Number 60) shall be 0.5 - 2.5 milliohm/cm.

Chloride - The maximum concentration of soluble chloride in the saturation extract (Method 3a, USDA Handbook Number 60) shall be 150 mg/l (parts per million).

Boron - The maximum concentration of soluble boron in the saturation extract (Method 3a, USDA Handbook Number 60) shall be 1 mg/l (parts per million).

Sodium Adsorption Ratio (SAR) - The maximum SAR shall be 3 measured per Method 20b, USDA Handbook Number 60.

Aluminum – Available aluminum measured with the Ammonium Bicarbonate/DTPA Extraction shall be less than 5 parts per million.

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.

Heavy Metals - The maximum permissible elemental concentration in the soil shall not exceed the following concentrations:

	Ammonium Bicarbonate/DTPA Extraction parts per million (mg/kilogram) dry weight basis
arsenic	1
cadmium	1
chromium	10
cobalt	2
lead	30
mercury	1
nickel	5
selenium	3
silver	0.5
vanadium	3

If the soil pH is between 6 and 7, the maximum permissible elemental concentration shall be reduced 50%. If the soil pH is less than 6.0, the maximum permissible elemental concentration shall be reduced 75%. No more than three metals shall be present at 50% or more of the above values.

Phytotoxic constituent, herbicides, hydrocarbons etc. - Germination and growth of monocots and dicots shall not be restricted more than 10%. 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 Methods No. 8020.

2. Soil acceptance criteria for amended soil

The amended soil will be accepted if it complies with the following requirements. The soil will need to be leached if the concentration of boron exceeds 1 part per million, if the alkalinity is substantially over 8.0 or if the salinity exceeds 2.5 milliohm/cm.

Fertility - The range of the essential elemental concentration of amended soil shall be as follows:

	Ammonium Bicarbonate/DTPA Extraction parts per million (mg/kilogram dry weight basis
phosphorus	10 - 40
potassium	100 - 220
iron	5 - 35
manganese	0.6- 6
zinc	1 - 8
copper	0.3 - 5
boron	0.2 - 1
magnesium	50 - 150
sodium	0 - 100
sulfur	25 - 500
molybdenum	0.1 - 2

Soil Organic Matter Content – About 3% to 5% - 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.

2.3 SOIL AMENDMENT MATERIALS AND PRODUCTS

A. Organic Compost / Humus Materials: Organic matter or material of a general humus nature capable of sustaining the growth of plants, with no “foreign” matter (i.e. glass, plastic, etc.) or material toxic to plant growth. It shall be free of stones, lumps or similar objects larger than two inches in greatest diameter, roots or brush. It shall be weed free. Composts that have been derived from organic wastes that meet the following requirements and are approved by the project Soil Scientist are acceptable compost / Humus sources.

1. Humus material shall have an acid-soluble ash content of no less than 6% and no more than 20%.
2. The pH of the material shall be between 6 and 7.5.
3. The salt content shall be less than 10 milliohm/cm @ 25° C. on a saturated paste extract.
4. Boron content of the saturated extract shall be less than 1.0 parts per million.
5. Silicon content (acid-insoluble ash) shall be less than 50%.
6. Calcium carbonate shall not be present if to be applied on alkaline soils.
7. Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, peat mosses etc. low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials.
8. Composted wood products are conditionally acceptable [stable humus must be present]. Wood based products are not acceptable which are based on red wood or cedar.
9. Sludge-based materials are not acceptable.
10. Carbon:nitrogen ratio is less than 25:1.
11. The compost shall be aerobic without malodorous presence of decomposition products.
12. The maximum particle size shall be 0.5 inch, 80% or more shall pass a No. 4 screen for soil amending.

13. Maximum total permissible pollutant concentrations in amendment in parts per million on a dry weight basis:

arsenic	20
copper	150
selenium	50
cadmium	15
lead	200
silver	10
chromium	300
mercury	10
vanadium	500
cobalt	50
molybdenum	60
zinc	300
nickel	100

Higher amounts of salinity or boron may be present if the soils are to be pre-leached to reduce the excess or if the plant species will tolerate the salinity and/or boron.

B. Acceptance of amended soil

1. Take one sample per 100 cubic yards. After he has perfected his methods, the frequency can be less. Separate batches of organic amendments need to be tested and accepted.

2.4 PLANTING SOIL MIXES

A. AMENDED PLANTING SOIL MIX: Provide the following amendments of approved Harvested Soil or approved Imported Harvested Soil for planting soil. Percentages of components, unless otherwise noted, will be established upon completion of individual tests results for components of the various mixes.

1. Soil Base Material (On-site Harvested Soil or Imported Topsoil)

2. Uniformly incorporate amendments ingredients by tilling or by shovel. Organic Compost / Humus Matter shall be maintained moist, not wet, during mixing.

a. Mixing of Amendments: Add Organic Compost / Humus Matter and other soil amendments as specified by soil testing to Soil Base Material in proportions as specified and as confirmed by testing. Other amendments shall not be added unless approved to extent and quantity by Landscape Architect or Soil Scientist and additional tests have been conducted to verify type and quantity of amendment is acceptable.

3 Preliminary recommendations for bid purposes only. The final recommendations are subject to change.

a. Homogeneously blend the following materials into clean excavated soil. Remove debris, rocks and foreign material. Remove clods, rock and gravel larger than 1 inch in diameter. Excessive gravel should not be present. Rates are per cubic yard:

Ammonium sulfate (21-0-0) – 1/4 pound
Potassium sulfate (0-0-50) – 1/3 pound
Triple superphosphate (0-45-0) – 1/4 pound
Gypsum – 1 pound

Organic amendment – 15% by volume

B. TREE BOX SOIL MIX: UC 50/50 mix

1. 50% by volume number 16 medium sand.

2. 50% by volume medium peat, pH 4.0 to 6.5, ECe less than 3 millimho/cm, carbon:nitrogen ratio less than 25, minus 10 mesh, minimum cation exchange capacity is 50 millimoles per 100 grams, minimum 60% organic matter.

Medium sized , number 16 sand	Percent passing
4 mesh	100
10 mesh	98-100
16 mesh	68-82
32 mesh	0-20
60 mesh	0-1

3. Per cubic yard, blend the following materials into the lightweight soil:

Ureaformaldehyde (38-0-0)	1/3 pound
Potassium sulfate (0-0-50)	1/2 pound
Triple superphosphate (0-45-0)	1/3 pound
Agricultural gypsum	1/2 pound
Ground agricultural limestone (calcium carbonate)	approximately 5 pounds, adjust the acidity to achieve a final pH between 6.5 and 7.2

4. Properties of mix shall be as follows:

   a. Organic carbon – 4.0 to 8.0% by dry weight.
   b. Ammonium bicarbonate available DTPA nutrients.
   c. Potassium – 125 to 250 parts per million.
   d. Phosphorus – 25 to 40 parts per million.

5. Sufficient fertility for vigorous plant growth.

Chemical Properties	Soil Specified Values
pH	6.5 - 7.2
Salinity	0.5-2
Chloride	< 150
Soluble boron	< 1
SAR	<6
Phosphorus	31-44
Potassium	125-250
Iron	2-150
Manganese	0.3-35
Zinc	0.6-8
Copper	0.1-5
Magnesium	50-150
Sodium	0-100

Chemical Properties	Soil Specified Values
Sulfur	25-500
Aluminum	< 5
Molybdenum	0.1-2
Calcium carbonate	slight or none
Heavy metals	
Arsenic	<2
Cadmium	<2
Chromium	<10
Cobalt	<2
Lead	<60
Mercury	<1
Nickel	<5
Selenium	<3
Silver	<0.5
Vanadium	< 3

Units are mg/kg dry weight
Weight – about 65 to 70 pounds per cubic foot saturated

PART 3 - EXECUTION

3.1 SOIL SURVEY

A. Contractor shall review locations for soil samples with Landscape Architect for approval prior to commencing potholing procedure. Contractor shall pothole **four** hole**s** per acre. Contractor shall take individual soil samples from the top 2 feet, between 2 and 4 feet and between 4 feet and the depth of the excavation at each pothole. Contractor shall mark each sample by location and depth. Contractor shall send one pound of each sample by zone and depth to the laboratory for testing and evaluation. Contractor shall take Soil Samples from locations identified by Landscape Architect and Soil Scientist. Soil Samples shall be taken at least 14 days in advance of commencing earth moving and grading operations. Contractor shall allow sufficient time for performance of Soil Testing and Test Results which will identify areas of suitable soil for Soil Harvesting, Stockpiling and Reuse as Planting Topsoil.

3.2 SOIL HARVESTING

A. Harvest suitable soil as determined by the soil survey results. Soil harvesting needs to selective and limited to the better soil. The target soil is darker in color, is less dusty, is more friable and has lower compaction, probably contains roots, contains less rock and gravel, contains less debris, etc. Preliminary identification of Suitable Soil for Soil Harvesting will be made based on Soil Survey results.

B. Contractor shall Stockpile the apparently suitable soil based on evaluation by Soil Scientist of Initial soil testing. Place unsuitable soil in a separate location. Mark the apparently suitable soil and warn other trades to not place trash on the stockpile.

C. Generally, the stockpiles should not be higher than 6 feet. The stockpiles should be worked from the side – equipment should not be operated on the amended soil surface, especially after amending. Moist soils are more sensitive to damage than dry soil. Dry soil can be stockpiled higher, particularly if they are low in soil organic matter.

D. Take one sample per 100 cubic yard with a minimum of 10 samples from the suitable stockpile for additional soil testing by Soil Scientist to determine its properties and recommendations for amendments.

3.3 SOIL AMENDING

A. Based on Soil Scientist soil amendment recommendations the Contractor shall submit proposed method to amend the soil for acceptance. The Contractor shall submit one pound samples of proposed soil amendments to Soil Scientist for acceptance. Each new batch of soil amendment needs to be submitted for conformance to the initial approved sample. Amend the stockpiled harvested soil or in-situ harvested soil as approved by Soil Scientist.

B. Soil for planting shall be free of rocks over 1/2 inch in diameter and free of foreign debris, refuse, plants or roots, clods, weeds, sticks, solvents, petroleum products, concrete, base rock, or other deleterious or undesirable and unwanted materials. Soil shall be free of soil-borne diseases and capable of sustaining healthy plant life. Materials not meeting such requirements shall be removed, including all temporary road bases or pavement already in place.

3.4 SOIL AMENDING DEPTHS

A. Unless otherwise specified in the drawings or directed by Landscape Architect and Soil Scientist the depth of amended soil shall be as follows:

1. Shrub and Herbaceous Plantings
Amend to 18-inches depth for an area equal to future mature shrub drip line or for shared or mass planting areas amend entire planting area.

2. Turf Grass and Meadow Areas
Amend to 9-inches depth entire planting area.

3 Trees
Amend to depth of the rootballs for trees but not less than 30-inches to an area 36-inches beyond rootball edge.

3.5 ENHANCED SOIL DRAINAGE

A. General Site Areas

1. Remove the existing surface vegetation for shrubs and weeds taller than 6 inches.

2. Soil Augering:

a.) Auger holes 5 feet on center 1 foot in diameter, 6 feet deep. Uniformly blend gypsum into the excavated soil at the rate of 2 pounds per cubic yard and disperse the gravel throughout the soil. Fill the augered hole with amended soil. Lightly compact to about 80% compaction.

b.) Note: The soil in the augered holes could be PAM drenched when backfilling to help maintain porosity. The PAM drench will consolidate the soil and prevent subsidence. About 20 gallons of at 0.015% PAM solution would be needed for each hole. This will add to the time to complete the work.

3. Soil Conditioning:

a.) Verify that there is at least 9 inches of suitable soil in all areas. Add suitable import soil as needed to provide a minimum of 9 inches of suitable soil.

b.) Add fertilizers if required to provide for optimum fertility in the top 9 inches. Add soil organic soil organic amended to provide between 3% and 7% soil organic matter in the top 9 inches.

c.) When the soil is partially dry and is workable, disc the soil with a harrow disk at least 9 inches deep. Reduce the clods to less than 1 inch in diameter. Uniformly blend the fertilizers if used and soil organic matter if used into the soil.

d.) Test the soil for acceptance.

e.) Roll the soil with a turf roller to consolidate the soil.

f.) Irrigate the site for at least 2 weeks. Spray weeds with Roundup Pro. Repeat one more time.

g.) Remove surface rocks, gravel, and debris if present.

h.) Scratch the soil about ½ deep to prevent a sharp soil interface.

i.) Lay sod and roll for firm contact with soil.

j.) Irrigate. Provide for sufficient soil moisture but not excessive water.

B. Tree Pits

1. Auger vertical drain holes one per tree pit off-center at low elevation of excavation, 1 foot diameter, 6 feet deep. Fill with amended soil.

2. Before the amended soils are placed, rip the base soil 6 inches deep to avoid a sharp soil interface.

3.6 PREPARATION OF SUBGRADE:

A. Examine site and verify that conditions are suitable to receive Work and that no defects or errors are present which would cause defective installation of products or cause latent defects in workmanship and function.

B. Verify that the locations of utilities, structures and other underground items have been clearly marked and protected.

C. Use every possible precaution to prevent damage to existing conditions to remain such as structures, utilities, plant material to remain, walks on or adjacent to the Project Work.

3.7 PLACEMENT OF STOCKPILED OR IMPORTED TOPSOIL SOIL MIXES:

A. Install Planting Soil in 6 inch lifts and compact each lift by hand tamping to firm the soil and to prevent subsidence but not to exceed 80% compaction.

B. Do not proceed with the installation of the Structural Soil material until all walls, curbs, footings and utility work in the area have been installed. For site elements dependent on

Structural Soil for foundation support, postpone installation until immediately after the installation of Structural Soil.

C. Install subsurface planting area drain lines as shown on the Drawings prior to installation of Structural Soil material.

D. Excavate and compact the proposed subgrade to depths, slopes and widths as shown on the Drawings. Maintain all required angles of repose of the adjacent materials as shown on the drawings. Do not over excavate compacted subgrades of adjacent pavement or structures.

E. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade and or toward the subsurface drain lines as shown on the drawings.

F. Clear the excavation of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout silts or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Fill any over excavation with approved fill and compact to the required subgrade compaction.

G. Do not proceed with the installation of Planting Soil until all utility work in the area has been installed. All subsurface drainage systems shall be operational prior to installation of Structural Soils. Test drainage structures and verify working condition. Verify acceptable condition to protection boards and other waterproofing components and notify Construction Manager of any damage.

H. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use 1/2" plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.

1. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.

2. Any damage to the paving or architectural work caused by the soils installation Contractor shall be repaired by the Contractor at the Contractor's expense.

I. Maintain all silt and sediment control devices required by applicable regulations. Provide adequate methods to assure that trucks and other equipment do not track soil from the site onto adjacent property and the public right of way.

J. Before proceeding with Work, notify Owner, Owner’s Park Developer, Construction Manager and Landscape Architect in writing of unsuitable conditions and conflicts.

3.8 FINE GRADING

A. After the initial placement and rough grading of the Soil but prior to the start of fine grading, the Contractor shall request review of the rough grading by the Landscape Architect. The Contractor shall set sufficient grade stakes for checking the finished grades.

B. Adjust the finish grades to meet field conditions as directed.

1. Provide smooth transitions between slopes of different gradients and direction.

2. Fill all dips and remove any bumps in the overall plane of the slope.

a. The tolerance for dips and bumps in Planting Soil areas shall be a 1/2-inch deviation from the plane in 10'.

3. All fine grading shall be inspected and approved by the Landscape Architect prior to the installation of other items to be placed on the Planting Soil.

3.9 PLACEMENT OF MULCH

A. Place mulch as indicated on the Drawings.

3.10 ACCEPTANCE STANDARDS

A. The Landscape Architect will inspect the work upon the request of the Contractor. Request for inspection shall be received by the Construction Manager and Landscape Architect at least 10 days before the anticipated date of inspection.

3.11 CLEAN-UP

A. Upon completion of the Structural Soil installation operations, clean areas within the contract limits. Remove all excess fills, soils and mix stockpiles and legally dispose of all waste materials, trash and debris. Remove all tools and equipment and provide a clean, clear site. Sweep, do not wash, all paving and other exposed surfaces of dirt and mud until the paving has been installed over the Structural Soil material. Do no washing until finished materials covering Structural Soil material are in place.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil. Trash, and debris, and legally dispose of it off of the Owners property.

END OF SECTION 329100

SECTION 329300

PLANTING

PART 1 - GENERAL

1.1 SUMMARY

A. General: Provide Exterior Plantings in accordance with Contract Documents.

1. Drawings and general provisions of the Contract Documents, including General Conditions and Divisions 1 Specification Sections, apply to this Section.

B. Related Work Specified Elsewhere

1. Section 329113– Soil Preparation
2. Section328400 – Irrigation

C. Summary of Work: This Section includes the following:

1. Contractor shall furnish all labor, material, equipment, and services necessary to install all landscape planting as indicated on the approved plans and as specified herein, and shall perform all other incidental work necessary to accomplish the intent of this specification and the approved plans including the following:

a. Trees, Shrubs, Vines, Ornamental Grasses, and Herbaceous Plants
b. Fertilizers, and Mulches
c. Staking, guying, tying, and trunk guards.
d. Pest and disease control
e. Maintenance under contract and guarantee

1.2 REFERENCES

A. Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following:

1. ANSI Z60.1 “American Standard for Nursery Stock”

B. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendation or suggestion shall be deemed to be mandatory under this Contract.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

1. Product Data for each type of product indicated.

2. Label Data substantiating that planting materials comply with specified requirements.

3. Schedule indicating anticipated dates and locations for each type of planting. This schedule shall be submitted within 15 calendar days after Contract Notice to Proceed. Include in this schedule anticipated dates from commencement and sequencing of planting operations, including but not limited to selections and tagging, layouts and layout approval, placement of tree, and commencement of maintenance period.

4. Plant Submittals Shall Include: Submittal sources and photographs of actual trees and all other plant materials to be used on the project for review and approval by Landscape Architect.

5 Mulch: Submittal of 3 pound bag of material for approval by Landscape Architect.

6. Planting Soil: Submittal of 3 pound bag of each type of material specified for approval by Landscape Architect

B. Material Certificates: Chain-of-custody certificates certifying that wood products comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer 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: Require installer to maintain an experienced full-time supervisor on the Project Site during times landscaping is in progress. Supervisor shall not be changed, except with consent of the Owner. Supervisor shall represent contractor in contractor's absence, and all direction given to supervisor shall be as binding as if given to Contractor.

C. Nursery Stock Standards: Provide quality, size, genus, species, and variety of trees indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock".

1. Selection of plant material will be made by Landscape Architect (at Landscape Architect's discretion), who will tag plants at their place of growth before they are prepared for transplanting.

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

E. Applicable Laws: Meet requirements of applicable laws, codes, and regulations required by authorities having jurisdiction over Work.

F. Verification of Dimensions and Quantities: All scaled dimensions are approximate. Before proceeding with any work, carefully check and verify all dimensions and quantities. Immediately inform Owner of all discrepancies between drawings, specifications, and actual conditions. Do not work in any area where there is a discrepancy until approval to proceed has been received from Owner.

G. Forest Certification: Except for mulch and similar recycled wood-based materials and products, provide wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

H. Reuse of Nursery Boxes: Containers for plant materials must be reused by plant materials supplier or source for new plantings of similar type provided for the Work. Recycling plant containers by remanufacturing (or similar processes) for other uses or landfill (or similar type) disposal is not acceptable.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site. The Contractor shall furnish standard products in manufacturer's standard containers bearing original labels showing quantity, analysis, and name of manufacturer. All containers and bags shall remain on site until work is completed.

B. Stockpiling: Soil, mulch, or amendment materials, stored on Project Site temporarily in stockpiles prior to placement shall be protected from intrusion of contaminants and erosion. All stockpiled materials shall be placed on tarpaulin, heavy polyethylene sheeting or other suitable barrier to protect paving surfaces from staining or soiling by stockpiled materials. All temporary storage means and methods shall be approved by City Representative and Landscape Architect

C. Inspection:

1. Plants shall be subject to inspection and approval by Landscape Architect (at Landscape Architect's discretion) at the place of growth and again upon delivery and prior to planting for conformity to specification requirements as to quality, size and variety. Such approval shall not impair the right of rejection due to damage suffered in handling, transportation and/or planting. Rejected plants shall be removed immediately from the Project Site. Inspection by Landscape Architect outside the City of Los Angeles or beyond a 90-mile radius from the Project Site shall be made at the expense of the Owner. A Contractor's representative shall be present at all inspections at the Contractor's expense.

2. Written requests for inspection of plant material at their place of growth shall be submitted to Landscape Architect at least 14 calendar days prior to delivery along with submittal of photographs of plants to be inspected. The Landscape Architect may refuse inspection if in his/her judgment a sufficient quantity or quality of plants is not available for inspection. The Contractor shall, at his own expense, supply the Landscape Architect with such labor and assistance as may be necessary in the handling of material for proper inspection.

3. Tagging of trees shall be as follows: for every 20 trees planted, 22 trees will be tagged assuring appropriate replacement for (a) trees damaged prior to transplanting, and (b) trees requiring replacement under terms of the one-year warranty.

4. Reject all materials, prior to planting, that are found unacceptable, and coordinate alternate selections with Landscape Architect.

E. Trees and Shrubs:

1. Do not prune before delivery, except as approved by Landscape Architect. Protect bark, branches, and root systems from sun-scald, drying, sweating, whipping, and other handling and tying damage. Do not bend trees and shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop trees and shrubs during delivery.

2. Deliver trees after preparations for planting have been completed and install immediately. If planting is delayed for more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist. Notify Construction Manager and Landscape Architect three (3) working days prior to delivery of trees. Do not deliver more trees and shrubs than can be planted in one day. It is not permissible to retain unplanted trees and shrubs on-site overnight.

3. Water as often as necessary to maintain root systems in a moist condition.

E. Ornamental Grasses and Herbaceous Material

1. Deliver healthy container plants. Do not prune before delivery, except as approved by Landscape Architect. Protect plant and root from sun-scald, drying, sweating, whipping, and other handling and tying damage. Provide protective covering during delivery. Do not drop ornamental grasses and herbaceous material during delivery

2. Deliver ornamental grasses and herbaceous material after preparations for planting have been completed and install immediately. If planting is delayed for more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist. Do not deliver more ornamental grasses and herbaceous material than can be planted in one day. It is not permissible to retain unplanted ornamental grasses and herbaceous material on-site overnight.

3. Water as often as necessary to maintain root systems in a moist condition.

1.6 PROJECT CONDITIONS

A. Utilities: Determine location of utilities including lighting, irrigation and drainage in planting areas; and perform work in a manner, which will avoid damage. Hand excavate, as required.

B. Mechanical Lifting: The Contractor shall be responsible for lifting plant material, planting soils and other required material to planter areas for planting through exterior means or lifts as approved by the City Representative and Landscape Architect.

C. Safety: The Contractor shall be responsible for pedestrian and vehicular safety and control within the Project Site. He/she shall provide the necessary warning devices and ground personnel needed to give safety, warning and protection to persons and vehicular traffic within the area.

D. Environmental Requirements and Planting Schedule: Plant weather permits. Do not plant when the ground is excessively wet, or the soil is otherwise in an unsatisfactory condition for planting:

E. Clean-up: Upon completion of each phase of work under this section, the Contractor shall clean and remove from the area all unused materials and debris resulting from the perfor-

mance of the work. All paved areas and walks within the project site shall be left in a clean and safe condition.

1.7 WARRANTY

A. Warranty: Warrant all planting materials, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, abuse by Owner, abnormal weather conditions unusual for warranty period, or incidents that are beyond Contractor's control.

1 All plant material (including shrubs and ground cover) for a period of one year after the date of Substantial Completion.

2. Remove and replace dead planting materials immediately unless required to plant in the succeeding planting season.

3. Replace planting materials that are more than 25% dead or in an unhealthy condition at end of warranty period.

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

1.8 PLANT MAINTENANCE

A. Maintain trees, shrubs and herbaceous plantings by pruning, cultivating, watering, weeding, fertilizing, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Restore or replace damaged tree wrappings. Maintain trees, shrubs and herbaceous plantings for the following period: 90 calendar days following Substantial Completion.

PART 2 - PRODUCTS

2.1 TREES, SHRUBS, AND VINES

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

1. Grade: Provide trees, shrubs and herbaceous plants of sizes and grades conforming to ANSI Z60.1 for type of tree required. Trees, shrubs and herbaceous plants of a larger size may be used if acceptable to Landscape Architect, with proportionate increase in size of roots or balls or container.

2. Species: All trees, shrubs and herbaceous plants shall be true to species and cultivar specified. Certification of cultivars by supplying nursery must be supplied in writing to Construction Manager and Landscape Architect.

3. Labels: Label at least 1 tree, shrub or herbaceous plant of each variety and size with a securely attached, waterproof tag bearing legible designation of botanical and common name. Field Tags by Landscape Architect shall not be removed until so directed by City Representative and Landscape Architect.

4. Single Stem 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.

5. Branching Height: For single-stem trees branching height shall be 5-0" and not more than 1/2 tree height or as required by Landscape Architect or indicated on the Drawings. Limbing up shall not deform natural form of the tree.

6. Multiple-Stem Trees: Multiple-stem trees with multiple basal or low branched stems, and well-balanced crown, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required. Unless specified otherwise multiple-stem trees shall have 3 to 5 stems minimum.

7. Depth of Planting: The depth of planting must be checked for all trees being tagged at the nursery. If the root/trunk flare is not visible, the root/trunk (the intersection of the trunk and the buttress roots) must be located. Any tree with significant adventitious root growth or evidence of girdling roots shall be subject to rejection by Landscape Architect on a case by case basis. Any soil above the root/trunk flare shall be removed prior to digging. After the removal of any excess soil above the root/trunk flare, the tree shall be hand dug and drum laced.

8. Container Grown Material: Container grown shrubs and herbaceous plants shall be nursery grown, conforming to ANSI Z60.1. Shrubs shall be healthy, vigorous, well rooted, fully branched, symmetrical, and well formed. Container stock shall have well developed fibrous roots, so that the root mass will retain its shape and hold together when removed from the container. Container plants shall not be root bound.

9. Substitution. Substitution by Contractor shall not be permitted.

10. Ornamental Grasses and Herbaceous Material Sources: Ornamental Grasses and Herbaceous material shall be provided by grower specializing in Ornamental Grass and Herbaceous plant production.

11. Sources: Unless otherwise specified all plant materials shall be from a well established Southern California region grower or nursery. Plants shall come from the following sources:

    a. GENERAL NURSERIES

        Sources:
        Tree of Life Nursery
        33201 Ortega Highway
        P.O. Box 635
        San Juan Capistrano, CA 92693
        Tel: (949) 728-0685
        Fax: (949) 728-0509
        www.TreeOfLifeNursery.com

        Las Pilitas Nursery
        8331 Nelson Way
        Escondido, CA 92026
        Phone 760.749.5930
        Fax 760.749.5932

Berylwood Tree Farm
1048 E La Loma Avenue
Somis, CA 93066
Tel: (805) 485-7601

Norman's Nursery
8665 Duarte Road
San Gabriel, CA 917775
Tel: (626) 285-9795
Fax: (626) 287-2352

Monrovia Nursery
18331 E. Foothill Boulevard
Azusa, CA 91702-1385
Tel: (800) 999-9321
www.monrovia.com

San Marcos Growers
125 South San Marcos Road
Santa Barbara, CA 93000
Tel: (805) 683-1561
Fax: (805) 964-1329

Native Sons, Nursery
379 West El Campo Road
Arroyo Grande, CA 93420

ABC Nursery
424 E. Gardena Blvd.
Gardena, CA 90248
Tel: (800)654-8062
Fax: (310) 327-1608

Boething Treeland Nursery
23475 Long Valley Road
Woodland Hills, CA 91367
Tele: (818) 883-1222
Fax: (818) 712-6979
www.boethingtreeland.com

Or approved equal

2.2 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing to trees and shrubs, consisting of one of the following:

"Walk On" Shredded Bark Mulch. Natural fir and blended wood product with non-toxic mineral dye; treated with fungus and insect repellent; consisting of organic composted hummus and wood; screened to 2 to 3 inches. Bark mulch shall not contain plastic, bio-solids or other debris. Color to match Landscape Architect's reference sample.

a. Wood Mulch - Type 1: "Forest Blend".

Supplier: Tierra Verde Industries, 7982 Irvine Blvd, Irvine, CA 92618, Phone: (949) 551-0363, Fax: (949) 551-1532; or equal.

b. P-104 and P-107 Mulch - Wood Chips – Double Ground - ADA accessible mulch.

Supplier: Artesia Sawdust Products, Inc. 13434 Ontario Avenue, Ontario, CA 91761, Phone: (909) 947-5983, Fax: (909) 923-7208.

2.3 FILTER FABRIC BARRIERS

A. All filter fabric shall be synthetic and rot proof.

B. Non-Woven, UV stabilized, polypropylene geo-textile shall be 140 NL as manufactured by Mirafi 718-461-2200, or approved equal.

2.4 TREE BRACING

A. Stakes: Straight grained lodgepole pine free of knots, splits, checks or disfigurements. Stakes shall be 2 inch minimum nominal size in diameter and 10 feet length, or as required by tree height. Stakes shall have a 10 inch tapered driving point.

B. Guy and Tie Wire: No. 12 gauge double wire twisted.

C. Support: Supports for staking shall be Treestrap, Model Number #3742T Hight Performance Biodegradable Tackstraps manufactured by GCS, Inc.

Treestrap
Manufacturer: GCS, Inc.
230 Center Street
North Wales, PA 19454
Tel: (800) 360-3584 / (215) 661-9070
Fax: (215) 661-9071
www.treestrap.com

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plantings for compliance with requirements and for conditions affecting performance of Work in this Section.
B. Utilities and Structures located in planting areas. Verify that the locations of lighting, drainage and irrigation utilities, structures and other underground items have been clearly marked.

C. Sequencing: Do not commence planting until soil testing, site fine grading, soil import, and preparation has been completed and improved by Owner. Ensure all drainage swales and flow lines have been established and accepted prior to planting.

D. Inspect and approve all sprinkler work and finish grading prior to the start of shrub and ground cover planting as specified. Trees may be planted in advance of landscape irrigation system installation, provided approved by the Landscape Architect and that adequate provision is made in advance for interim watering.

E. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, (existing equipment to reamin), drainage structures, and other facilities, and existing trees to remain from damage caused by planting operations. This includes maintaining all protective barriers in place unless directed otherwise by Owner. Vehicles and equipment shall not be parked, serviced, permit burning or operated within drip line of existing trees or within newly planted areas.

B. Remove existing plant materials and planting soils which are designated for removal in the documents.

C. Do not remove, sever or impact root structures of existing trees to remain in the preparation of sub-grade tree pit conditions. Conflicts with existing tree roots shall be brought to the attention to the Landscape Architect who may alter the required configuration to preserve or protect tree roots as they exist.

D. Test drainage structures and verify working condition.

E. Weed Control:
Before and during preliminary and finish grading, dig out all weeds and grasses by roots and dispose of off-site. Prior to planting, eliminate any weeds present in delivered plant stock. Unless otherwise instructed by Owner. Grasses not of perennial type, except for Torpedo Grass and Nut Grass, less than 2-1/2” in. high and not bearing seeds, may be turned under. Perennial weeds and grasses to be removed include, but are not limited to, the following:

a. Nut Grass
b. St. Augustine
c. Puncture Vine
d. Morning Glory
e. Dog Fennel
f. Torpedo Grass
g. Common Bermuda Grass
h. Kikuyu Grass

Remove other noxious or invasive weeds.

Site shall be maintained weed-free throughout planting operations and until final acceptance by Owner. Submit a weed control program to Owner for approval with in 21 calendar days after ward of Contract and prior to starting of work. Include all product information and frequency of weed control operations.

3.3 TREE PLANTING

A. Layout individual tree locations and areas for multiple plantings. Trees shall be staked prior to planting shrubs, grasses and herbaceous plants in order to establish the planting structure of the site. Stake locations, adjust locations when requested, and secure Landscape Architect acceptance before the start of planting work including tree pit preparation.

B. After digging plant hole but prior to installing tree, install Enhanced Soil Drainage according to Planting Soil specifications.

C. Tree root-ball shall be firmly placed on compacted setting bed and established at correct location, elevation and in plumb upright condition. Use temporary guy wires to secure tree in place as required during planting soil placement, to maintain proper setting location. Tree root ball must be set above finish grade so that the original root/trunk flair is at the proper relationship to finished planting soil grade after compaction and settlement.

D. All ropes and strings must be cut, non-biodegradable material must be removed and burlap folded back from the top one-quarter of root-ball. Do not remove burlap from lower sides or under root ball. Do not use planting stock if root-ball is cracked or broken before or during planting operation.

E. Only when placement of trees has been approved by Landscape Architect may back-fill planting soil be placed in excavated areas around root ball. Do not make saucer indentations.

F. Back-fill planting soils shall be placed in uniform six to eight inch lifts. Soil must be firmed at each lift interval by hand tamping as required to settle back fill and eliminate voids and air pockets.

G. Staking and Guying: Provide staking per Drawings.

H. Water thoroughly after planting, taking care not to cover plant crowns with displaced wet soil. Adjust finish grades and reset plants if settlement occurs. Place mulch and repeat watering procedure.

I. Wrap the trunks of trees immediately after planting with specified trunk guard material at base of tree. Uncoil and place around base of tree. Ensure complete protection with flared end in contact with ground. For larger trunk diameters, couple multiple sections together, securely interlocking tabs as recommended by manufacturer.

3.4 SHRUB AND HERBACEOUS PLANTING

A. Layout individual shrubs, grasses and herbaceous plants for multiple planting areas only after the location of trees have been planted. Shrub, Grasses, and Herbaceous groupings shall be marked out on the ground to establish the zones into which these plantings are to be planted. Once the zones are established individual shrubs, grasses and herbaceous plants shall be placed according to specified spacing and layout as indicated on drawings. Stake locations, outline area, and secure Landscape Architect's approval before starting planting. Make adjustments to layout as directed by Landscape Architect.

B Landscape Architect may request a full temporary placement of plants, still in their pots, according to plan or as directed for inspection by Landscape Architect prior to commencing with planting operation. Landscape Architect may adjust planting layout and spacing at his discretion during the planting operation.

C. Dig holes big large enough to allow spreading of roots, and backfill with planting soil. Work soil around root ball to eliminate air pockets. Do not make saucer indentations.

D. Water thoroughly after planting, taking care not to cover plant crowns with displaced wet soil. Adjust finish grades and reset plants if settlement occurs. Place mulch and repeat watering procedure.

3.6 MULCH PLACEMENT

A. Place mulch; refer to Section 32 91 13.1through out planting areas and as indicated in construction drawings. Protect planting material from damage during and after installation of mulch.

3.7 INITIAL PRUNING:

A. Contractor shall prune trees and shrubs as directed by Landscape Architect and according to the Contract Documents.

1. Prune, thin and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by Landscape Architect, do not cut tree leaders; remove only injured or dead branches.

3.8 CLEAN-UP AND PROTECTION

A. During landscaping keep pavements clean and work area in an orderly condition. Protect landscaping from damage due to landscape operations, operations by other contractors and trades and trespassers. Treat, repair or replace damaged landscape work as directed.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil. Tree boxes, Trash, and debris, and legally dispose of it off of the Owners property.

3.10 FINAL INSPECTION AND FINAL ACCEPTANCE

A. At the end of the warranty period the Landscape Architect and Owner will inspect all warranted work at the written request of the Contractor. The request shall be received 10 calendar days before the anticipated date for Final Inspection.

END OF SECTION 329300