

SIERRA NORTH PARK PROJECT

PROJECT MANUAL – TABLE OF CONTENTS

DIVISION 1

GENERAL REQUIREMENTS

Section 01010	Project General Requirements
Section 01045	Cutting and Patching
Section 01055	Storm Water Pollution Prevention
Section 01100	Stormwater Runoff
Section 01220	Progress Meetings
Section 01250	Contractor's Request For Information
Section 01310	Construction Schedules
Section 01340	Shop Drawings, Product Data and Samples
Section 01370	Schedules of Values
Section 01400	Quality Control
Section 01500	Temporary Facilities
Section 01537	Tree Protection
Section 01600	Transport, Handling and Storage
Section 01640	Product Handling and Protection
Section 01700	Contract Closeout
Section 01720	Project Record Documents
Section 01800	Construction and Demolition Debris Recycling

DIVISION 2

SITE WORK

Section 02100	Survey and Field Engineering
Section 02170	Selective Demolition
Section 31 20 00	Grading
Section 02230	Site Clearing
Section 02500	Aggregate Base Course
Section 02510	Asphalt Concrete Paving
Section 02527	Permeable Aggregate and Porous Asphalt Paving
Section 02570	Pavement Markings
Section 02755	Decomposed Granite Paving
Section 02770	Site Furnishings
Section 02780	Vehicular Entrance Gate
Section 02810	Landscape Irrigation
Section 02900	Landscaping
Section 33 40 00	Storm Drainage Systems
Section 33 46 00	Subdrainage

DIVISION 3

CONCRETE

Section 03100	Concrete Formwork
Section 03200	Concrete Reinforcement
Section 03270	Grout-set and Adhesive Anchors
Section 03300	Cast-in-Place Concrete
Section 03345	Concrete Finishing

DIVISION 4

MASONRY

Section 04230	Concrete Masonry
---------------	------------------

DIVISION 5

METALS

Section 05120 Structural Steel

DIVISION 10 SPECIAL CONSTRUCTION

Section 10 70 00 Prefabricated Restroom Building
Section 10 73 00 Protective Covers
Section 13130 Signing and Striping

DIVISION 26 ELECTRICAL

Section 26 05 10 Basic Electrical Material & Methods
Section 26 05 17 Dry Type Transformers
Section 26 05 19 Insulated Wires and Cables
Section 26 05 26 Grounding and Bonding
Section 26 05 53 Identification for Electrical Systems
Section 26 08 00 Test Support/Start Up
Section 26 09 23 Lighting Controls and Instrumentation
Section 26 28 16 Enclosed Circuit Breakers and Panelboards
Section 26 50 00 Lighting

SECTION 01010

PROJECT GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Scope of the Contract (1.02)
- B. Work Not Included (1.03)
- C. Drawings (1.04)
- D. Time of Completion (1.05)
- E. Long Lead Time Materials and Equipment (1.06)
- F. Liquidated Damages (1.07)
- G. Examination of Site and Work (1.08)
- H. Cooperation (1.09)
- I. Restrictions to the Work (1.10)
- J. Cutting and Patching (1.11)
- K. Shop Drawings (1.12)
- L. Cleaning (1.13)
- M. Protective Measures (1.14)
- N. Project Administration (1.15)
- O. Best Management Practices (BMP) Requirements (1.16)

1.02 SCOPE OF THE CONTRACT

- A. Work to be done under the Contract consists of furnishing all materials, all equipment, and performing the Work required by these Specifications and the Drawings hereinafter, described and necessary, to complete the construction of the "Sierra North Park Project."

- B. The project includes but is not limited to construction of a bicycle pump track, plantable retaining wall, excavation and import, finish grading and drainage, a stormwater retention system, parking lot paving with curb and gutter, utilities, concrete walkways and stairs, pre-fabricated restroom building, shade shelters, lighting, site electrical, irrigation and landscaping at Sierra North Park.

1.03 WORK NOT INCLUDED

All items indicated on the Drawings as "N.I.C." (not in contract).

1.04 DRAWINGS

The Work shall conform to the Drawings entitled " Sierra North Park " with sheet numbers and titles as listed on Sheet No.1 of the Drawings.

1.05 TIME OF COMPLETION

- A. The work to be performed under the contract shall be completed within **240 calendar days**, beginning with the date stipulated in the written notice to proceed issued by the Owner. The work includes a maintenance period which must which be completed and accepted by the Owner within the **240 calendar day** period.
- B. Failure to complete the work by the identified completion date will be subject to the Liquidated Damages identified in Paragraph 1.07.
- C. Final Payment Request shall be submitted within twenty (20) days after Substantial Completion.

1.06 LONG LEAD TIME MATERIALS AND EQUIPMENT

- A. The Contractor shall make every effort to demand of his Subcontractors and suppliers, relative to long lead time items, that they order such items well in advance of the scheduled time of installation. Time extensions for late ordering of such materials will not be allowed.

1.07 LIQUIDATED DAMAGES

- A. All time limits stated in the Contract Documents are of the essence of the Contract and should the Contractor fail to complete the work required to be done on or before the time of completion as set forth in these specifications, including any authorized extension of time, it is mutually understood and agreed by and between the awarding entity and the Contractor that the use by the public of the Contract Work will be correspondingly delayed, and that by reason thereof, the awarding entity and the public will necessarily suffer

great damages; that such damages from the nature of the case will be extremely difficult and impractical to fix; and that the awarding entity and the Contractor have endeavored to fix the amount of said damages in advance as follows:

1. The **sum of \$500 a day** for each day's delay in the completion of the work to be performed in number of calendar days completion period specified.
- B. It is further mutually understood and agreed by and between the awarding entity and the Contractor that the sum of liquidated damages set forth above will be additive to a **total of \$500 a day** for each and every day's delay in the event that the time limits, as hereinbefore specified, are concurrently exceeded. Any authorized extensions of time will be added to the time limits stipulated.

1.08 EXAMINATION OF SITE AND WORK

- A. Bidders must examine the location, physical conditions, and surroundings of the proposed Work and judge for themselves the extent to which these factors will influence the performance of the Contract Work.
- B. The plans for the Work show conditions as they are supposed or believed by the Owner to exist, but it is not intended, or to be inferred, that the conditions as shown thereon constitute a representation, express or implied by the Owner or its officers, that such conditions are actually existent, nor shall the Contractor be relieved of the liability under his Contract, nor the Owner, or any of its officers, be liable for any loss sustained by the Contractor as a result of any variance between conditions as shown on the plans or referred to in the Specifications and the actual conditions revealed during the progress of the Work.
- C. The Owner will conduct a mandatory pre-bid conference and site visitation at the site.

1.09 COOPERATION

In the entrance and exit of all workers and in bringing in, storing, or removing of materials and the erection and maintenance of equipment and in the manner and time of prosecuting the work, the Contractor shall cooperate with those in authority on the premises to prevent the entrance of those whose presence is forbidden or undesirable and he shall observe all rules and regulations in force on the premises and avoid undue interference with the convenience, sanitation, and routine of Owner occupying the premises.

1.10 RESTRICTIONS TO THE WORK

- A. The Owner reserves the right to determine which of the Contractor's operations are noise, dust, or dirt producing, or which disrupt utility service, or which constitute blocking of passageways, exits, entrances, etc., or which in any way constitute an interference in the proper function of the building.
- B. Contractor shall maintain clear access to all protection equipment at all times, including access to fire hydrants.
- C. Control of Tools: During the progress of the work, all hand tools, including power driven hand tools, cables, ropes, and other implements shall be transported and retained, except when in use in an approved locked toolbox. Care shall be taken that no tool is left unguarded or left where it might be taken by an unauthorized person.
- D. All work by the Contractor is subject to inspection at anytime and without notice by the Owner.
- E. The working hours are Monday through Friday between 8:00 a.m. to 5:00 p.m. unless otherwise specified by the Owner.

1.11 CUTTING AND PATCHING

The Contractor shall perform all cutting, patching, and finishing operations occasioned by the Work under the Contract, whether or not such operations are indicated on the Drawings or specifically mentioned in the various sections of the Specifications. All such operations shall be performed in the best practices of the various trades involved and to the satisfaction of the Owner. All patching and finishing materials shall match existing adjacent surfaces in every respect, including design, type and quality of materials, finish, and color. Cutting, patching, and finishing shall include all such operations in existing areas required by the Work under the Contract.

1.12 SHOP DRAWINGS

Furnish shop drawings as required in the various sections of the Specifications or as requested by the Owner. Unless otherwise specified, submit six (6) copies of shop drawings to the Owner for review. One set will be returned to Contractor marked "no exceptions noted" or exceptions noted." If changes are required, six (6) copies of corrected shop drawings shall be delivered to the Owner. Shop drawings shall be of sufficient size and scale to clearly show all details; shop drawings of millwork and cabinet work shall show molding full size. No materials shall be furnished or Work done on items requiring shop drawings prior to acceptance. Acceptance of shop drawings shall not relieve the Contractor from responsibility for deviations from the Contract Documents, nor from responsibility for errors or omissions of any sort in the shop drawings. Neither does such

acceptance relieve the Contractor from his responsibility for the correct installation, or for the proper operation in service, of items requiring shop drawings.

1.13 CLEANING

During progress of Work and upon completion of each part of the Work as defined by the sections into which these Specifications are divided or as separated by the various trades involved in the Work, each area shall be cleaned of debris emanating from the Work. The Contractor shall remove excess materials, waste, rubbish, and debris, and his construction and installation equipment from the premises. Any dirt and stains caused by the Work under the Contract shall be removed from the surfaces of the structures and from equipment and fixtures. Final acceptance of the Work done under these Specifications will not be given until the cleaning has been inspected and approved by the Owner.

1.14 PROTECTIVE MEASURES

The Contractor shall provide and maintain substantial and adequate protection as may be required to protect new and existing Work and all items of equipment and furnishings for the entire duration of Work. The Contractor shall repair or make good any and all damage or loss he may cause to the building or other Owner property to the full satisfaction of the Owner.

1.15 PROJECT ADMINISTRATION

All materials supplied and all Work done by the Contractor shall be under the general administration of the Owner and in accordance with the Drawings and Specifications.

1.16 BEST MANAGEMENT PRACTICES (BMP) REQUIREMENTS

- A. The Contractor shall comply with applicable requirements of the National Pollution Discharge Elimination System (NPDES). The Contractor is responsible for conforming to and using materials which meet the requirements of the above-specified rules.
- B. Related Work:
Cleaning; Section 01710.
- C. The Contractor shall submit to the Department of Public Works, Building and Safety Division for permit approval, a plan which complies to the above rules. The Contractor shall not commence with any Work without such approval.

END OF SECTION 01010 PROJECT GENERAL REQUIREMENTS

SECTION 01045

CUTTING AND PATCHING

PART 1 GENERAL

1.01 SUMMARY

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

1.02 SUBMITTALS

- A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:
1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
 2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the buildings appearance and other significant visual elements.
 3. List products to be used and firms or entities that will perform Work.
 4. Indicate dates when cutting and patching is to be performed.
 5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
 6. Approval by the Owner to proceed with cutting and patching does not waive the Owner's right to later require complete removal and replacement of a part of the work found to be unsatisfactory.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Use materials that are identical to existing materials. If identical materials

are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

END OF SECTION 01045 CUTTING AND PATCHING

SECTION 01055

STORM WATER POLLUTION PREVENTION

PART 1 GENERAL

1.01 STORM WATER POLLUTION CONTROL REQUIREMENTS

- A. The Contractor shall comply with the applicable requirements of the National and using materials that meet the requirements of the NPDES rules.
- B. The Contractor shall submit to the County Department of Public Works, Building and Safety/Land Development Division, for permit approval a plan which complies with the NPDES rules. THE CONTRACTOR SHALL NOT COMMENCE WORK WITHOUT THE NECESSARY APPROVALS.
- C. Prepare, implement, and monitor the approved Storm Water Pollution Prevention Plan (SWPPP) for the purpose of preventing the discharge of pollutants from the construction site into the receiving waters.
- D. These requirements shall also be addressed in the cleaning section of Division 1 Section 01710.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Use materials and methods described in California Storm Water Best Management Practice Handbook for Construction Activity (BMP Handbook), latest edition.

PART 3 EXECUTION

3.01 PREPARATION AND APPROVAL

- A. Prepare the Storm Water Pollution Prevention Plan (SWPPP) as required to comply with storm water pollution regulations.
- B. Within two weeks after Award of Contract by the Owner, submit to the County two copies of the SWPPP for review and corrections. After the County's approval, provide four copies of the corrected or modified SWPPP to the Owner.

- C. On project sites that are five acres or more, submit to the County a completed Notice of Intent (NOI) and application fee payable to the State Water Resources Control Board with copies of the approved SWPPP indicated in Paragraph B above.

3.02 IMPLEMENTATION

- A. Install perimeter controls prior to starting other construction work at the site.
- B. Contain on-site storm water at the job site. Do not drain on-site water directly into the storm drain.
- C. Designate trained personnel for the proper implementation of the SWPPP.
- D. Revise SWPPP to suit changing site conditions and also when properly installed systems are ineffective.
- E. At the end of Construction Contract:
 - 1. Leave in place the storm water pollution prevention controls needed for post-construction storm water management and remove those that are needed as determined by the County. Thereafter, left-in-place controls will be maintained by the Owner.
 - 2. Provide Site Monitoring Reports, SWPPP revisions, Compliance Certifications, and related documents to the County.
 - 3. Post-construction storm water operation and management plan as mentioned in the compliance certifications are considered to be in place at the end of the Construction Contract.

3.03 MONITORING

- A. Conduct examination of storm water pollution prevention controls monthly, as well as before and after each storm. Prepare and maintain at the job site a log of each inspection using Site Monitoring Report forms.

3.04 LIABILITIES AND PENALTIES

- A. Review of the SWPPP and inspection log by the County shall not relieve the Contractor from liabilities arising from non-compliance of storm water pollution regulations.
- B. Payment of penalties for non-compliance by the Contractor shall be the sole responsibility of the Contractor and will NOT be reimbursed by the Owner.

3.05 CHANGE OF INFORMATION

- A. Submit to the County a completed NOI for change of information (Construction Site Information and Material Handling/Management Practices).

END OF SECTION 01055 STORM WATER POLLUTION PREVENTION

SECTION 01100

STORMWATER RUNOFF

PART 1 GENERAL

1.01 WATER POLLUTION

- A. Attention is directed to the General Conditions and these special provisions.
- B. The Contractor's attention is directed to the requirement that he shall exercise every reasonable precaution to protect streams, bays and ponds from pollution with fuels, oils, bitumens, calcium chloride and other harmful materials and shall conduct and schedule his operations so as to avoid or minimize mudding or silting of said streams, rivers, bays and ponds.
- C. Effective, approved erosion control devices and controls are required during the rainy season, October 15 through April 15, to control surface drainage. The Contractor shall provide emergency twenty-four (24) hour telephone number(s) of responsible Contractor personnel.
- D. The Contractor shall prepare and submit to the Engineer a Storm Water Pollution Prevention Plan (SWPPP) in conformance with the California Storm Water Best Practice Handbooks (See Appendix "B") detailing pollution, erosion and runoff control measures.
- E. Payment for the requirements of Storm Water Pollution Prevention Plan shall be considered as included in the various items of work and no additional compensation will be made.

1.02 RUNOFF CONTROL MEASURES

- A. In the course of water control the Contractor shall conduct his construction operations to protect waters from pollution with fuels, oils, bitumens or other harmful materials.
- B. The following runoff control measures shall be observed at all times during the course of construction.
 - 1. Sediment, construction waste, and other pollutants from construction sites and parking areas shall be retained on the site to the maximum extent practicable.
 - 2. Any sediments or other materials which are not retained on the site shall be removed within 24 hours from the time of notification by the

Engineer. In lieu of removal, a temporary barrier shall be installed.

3. Excavated soil shall be located on the site in a manner that minimizes the amount of sediments running into the street or adjoining properties. Soil piles shall be covered until the soil is used or removed.
 4. No washing of construction or other industrial vehicles shall be allowed at or adjacent to the construction site. No water from the washing of vehicles shall be allowed to run off into a storm drain system unless treated to remove sediments of particles.
 5. Stormwater pollution from concrete materials and wastes shall be reduced by:
 - a. Conducting washout of concrete trucks offsite in manner approved by local building codes and ordinances or onsite wash out area approved by the Owner.
 - b. Storing materials under cover, away from drainage areas; and
 - c. Avoiding mixing excess amounts of concrete or cement on-site.
- C. The Contractor shall prepare and have all proposed runoff control measures detailed in a Storm Water Pollution Prevention Plan which shall be submitted and approved by the Engineer prior to start of construction.

PART 2 PRODUCTS

Various applicable documents, including but not limited to: Stormwater Pollution Prevention Plan, General Construction Activities Stormwater Permit (GCASP) or Stormwater Construction Permit, etc.

PART 3 EXECUTION

(NOT USED)

PART 4 MEASUREMENT AND PAYMENT

No separate payment will be made for Stormwater Runoff required to install the project. The cost will be considered included in the unit price bid for construction or installation of the item to which such stormwater runoff is incidental or appurtenant and no additional compensation will be allowed.

END OF SECTION 01100 STORMWATER RUNOFF

SECTION 01220

PROGRESS MEETINGS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Scheduling and administration of progress meetings.

1.02 RELATED REQUIREMENTS

- A. Instructions to bidders.
- B. Project general requirements.
- C. Construction schedules.
- D. Shop drawings, product data and samples.
- E. Quality control.
- F. Temporary Facilities.

1.03 PROGRESS MEETINGS

- A. The Owner will schedule and administer progress meetings, called meetings and pre-installation conferences, throughout progress of work.
- B. The Owner will make physical arrangements, prepare agenda and distribute notice of each meeting to participants and to Engineer, Project Manager and Inspector in advance of meeting date.
- C. The Project Manager will preside at meetings, record minutes, and distribute copies prior to next meeting to participants.
- D. Location of meetings: Project's field office or Project Manager's office.
- E. Attendance: Project Manager, Inspector, Contractor, job superintendent, subcontractors, suppliers, and others as appropriate to agenda; Engineer and others shall attend when appropriate.
- F. Minimum Agenda:
 - 1. Approval of minutes of previous meetings.

2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION 01220 PROGRESS MEETINGS

SECTION 01250

CONTRACTOR'S REQUEST FOR INFORMATION

PART 1 GENERAL

1.01 SUMMARY

- A. This section covers general requirements for Contractor's Requests for Information (RFI).
- B. Related Sections:
 - A. General and Supplementary Conditions for changes in the Work.
 - B. Section 01220: Progress Meetings
 - C. Section 01340: Submittals

1.02 SUBMITTALS

- A. Submit a Request for Information to the Owner when:
 - 1. An unforeseen condition or constructability question occurs.
 - 2. Questions regarding information in the Contract Documents arise.
 - 3. Information not found in the Contract Documents is required
- B. When possible, request such clarification either verbally or in writing at the next scheduled Project meeting. When the RFI is answered at the Project meeting, number the RFI and enter the response into the meeting minutes.
 - 1. When the urgency of the need or the complexity of the item makes clarification at the next scheduled Project meeting impractical, prepare and submit a formal written RFI to the Owner.
- C. RFIs shall be submitted within a reasonable time frame so as not to interfere with or impede the progress of the Work. The Contractor shall make every effort to keep the number of RFIs to a minimum. If the number of RFIs becomes unwieldy, the Owner may require the Contractor to abandon the RFI process and submit requests as either submittals, substitutions, or requests for change.

- D. When the response to an RFI effects the cost or time duration of the project notify the Owner in accordance with the General Conditions at the time of the submittal. Notification shall occur prior to commencing such work, so that the change order process can be initiated.
1. At time of the time of submittal of the RFI, notify the Owner to the time available before the response will cause a time or cost impact to the Project.
 2. An answered RFI shall not be construed as approval to perform extra work.
- E. Form of Submittal:
1. Submit four copies of a legible written request on a standard CSI or AIA preprinted form or other such form as approved in advance by the Owner (a FAX followed by 4 copies forwarded by first class mail is acceptable.) Each request shall include the following information.
 - a. Project name, as listed on the Contract Documents, and County Specs. Number.
 - b. Date
 - c. RFI number
 - d. Name, address, telephone and fax number of the Contractor
 - e. Number and title of affected Specification Section(s)
 - f. Drawing numbers and detail numbers as appropriate
 - g. Clear, concise explanation of information or clarification requested
 - h. Blank, lined spaces for Architect's response.
 - i. Signature block for County to acknowledge review of Architect's response.
 2. Mark each page of each RFI attachment in the lower right corner with the RFI number.
 3. Number submitted RFIs consecutively
 4. Sign and stamp all RFI forms. RFIs from subcontractor or material suppliers shall be submitted through the Contractor. Contractor shall review all such information request prior to submitting to the Owner.
- F. Unanswered RFIs will be returned with a stamp or notification "Not Reviewed."

- G. RFI Log: Contractor shall maintain and update the log weekly and furnish to the County when requested. The log shall contain the following minimum information:
1. RFI number
 2. Date submitted
 3. Brief description of content or subject
 4. Date answered
- H. Allow a minimum of five (5) working days for review and response. The response time will be increased if more information is required, when the RFI is submitted out of sequence, or if in the opinion of the Owner, more time is required to answer the RFI.

1.03 QUALITY ASSURANCE

- A. Carefully review the Contract Documents before submitting a RFI to the Owner. Verify that the information requested is not indicated in the Contract Documents or cannot be determined from a careful review.
1. The Owner may not answer RFIs for information that is readily available in the Contract Documents.
- B. RFIs requesting clarification of coordination issues, shall include the Contractor's suggested solution as an attachment to the RFI.
1. Such coordination issues include, but are not limited to, pipe and duct routing, clearances, specific locations of work shown diagrammatically, and similar items.
 2. Provide scale drawings or sketches indicating the proposed solution.
 3. RFIs that do not include a suggested solution will not be answered.
- C. Do not use RFIs for the following:
1. To request approval of submittals.
 2. To request approval of substitutions
 3. To request changes to the Contract Documents and to confirm action taken by the Contractor for requested changes/substitutions to the Contract Documents.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

(Not Applicable)

END OF SECTION 01250 CONTRACTOR'S REQUEST FOR INFORMATION

SECTION 01310

CONSTRUCTION SCHEDULES

A. General

1. The Contractor shall provide a Construction Schedule for the Work in accordance with the requirements in the following paragraphs.
 - a. Construction Schedule shall portray all significant activities of the project including each trade or operation and major materials, submittals of shop drawings, equipment data, procurement of materials, and required approvals, by the Contractor and the Owner.

B. Submittal of Schedule

1. Contractor shall submit the Construction Schedule within fourteen (14) calendar days after receipt of the Notice to Proceed (NTP). The Contractor shall provide to the Owner for review four (4) copies of the Construction schedule indicating the sequence of operations, description of the work, calendar definition and duration showing entire job performed within the specified contract time.
2. If the schedule duration proposed by the Contractor is less than the completion date in the NTP, the proposed schedule will not nullify the Contractor's right to the NTP duration.
3. The Owner shall review the Contractor's Construction Schedule. The Contractor shall incorporate all the revisions requested by the Owner and submit the final schedule within seven (7) calendar days of its receipt from the Owner.
4. The Schedule of Values shall be prepared and submitted together with the Construction Schedule.
5. The Contractor shall be liable for the stipulated liquidated damages stated in the Contract if it fails to meet the 7 -day and/or 7 -day correction requirements.
6. The schedule shall be revised at no additional cost to the Owner and resubmitted for review when:
 - a. changes to Contract affect Contract completion time.
 - b. "slippage" occurs because of procurement delays, rain, strikes and other delays.

- c. any activities are modified from previous submittal.
- d. delay on initial non-critical items is of such magnitude as to change the critical path.

C. Preparation of Schedule

1. The schedule shall be a composite reflection of the exact job requirements needed to carryout all phases of work and to complete the work in accordance with the Contract Documents.
2. The schedule shall indicate the sequence of activities planned, the area within the facility of the work activity, logic ties or interdependence of the activities, and the time estimated in working days to perform each activity.
3. Each activity in the schedule, shall include the following information: Activity Designation/Number - (Description Label or Name), Duration, Calendar 10, Early start date, Late start date, Early finish date, Late finish time, identification of activities which comprise the critical path for completion and Total float.
4. The Contractor's Network shall consist of, but not limited to the following:
 - a. Proposed Procurement Activities including mobilization, shop drawing and sample submittals and the fabrication and delivery of key and long-lead procurement elements and indicate intended submittal dates and realistic delivery dates for fabrication and delivery activities.
 - b. Proposed Logic and Sequencing of Activities, including all construction phases and the logic between the phases.
 - c. Proposed Activities cross-referenced to a line item in the proposed Schedule of Values.

D. CONSTRUCTION SCHEDULE UPDATING

1. The Construction Schedule shall be updated on a monthly basis throughout the entire Contract Time, until Project Substantial Completion.
2. In case of disagreements at the Schedule Update Meeting concerning actual progress to date, the Owner's determination, shall govern.

E. TIME IMPACT ANALYSIS FOR CHANGE ORDERS, DELAYS, AND CONTRACTOR REOUESTS

1. When Change Orders (including Proposed Change Orders) are initiated, delays are experienced, or the Contractor desires to revise the Construction Schedule, the Contractor shall submit to the Owner a narrative describing the impact of the Change Order, delay, or Contractor request on the current Contract Completion Date. Each Time Impact Analysis shall include a schedule analysis and narrative demonstrating how the Contractor proposes to incorporate the Change Order, delay or Contractor request into the Construction Schedule. The Time Impact Analysis shall delineate the time impact based on the date the Change Order (including a Proposed Change Order) is given to the Contractor or the date the delay occurred; the status of construction at that point in time; and the time computation of all affected activities. The activity times used in the Time Impact Analysis shall be those included in the latest Construction Schedule Update or as adjusted by mutual agreement.
2. Activity delays shall not automatically mean that an extension of the Contract Time is warranted or due the Contractor. It is possible that a Change Order or delay will not affect existing critical activities or cause non-critical activities to become critical. A Change Order or delay may result in only absorbing a part of the available total float thereby not causing any effect on the Contract Completion Date.
3. Float is not for the inclusive use or benefit of either the Owner or the Contractor. Contract Time extensions will be granted only to the extent the equitable time adjustments to the activity or activities affected by the Change Order or delay exceeds the Contract Completion Date.
4. Four (4) copies of each Time Impact Analysis shall be submitted within seven (7) calendar days after the commencement of a delay or the notice of direction for a Change Order (including a proposed Change Order) is given to the Contractor.
5. In cases where the Contractor does not submit a Time Impact Analysis within seven (7) calendar days, it is mutually agreed that the particular Change Order (including a Proposed Change Order) delay or Contractor request does not require a Contract Time extension.
6. The County shall approve or reject each Time Impact Analysis unless subsequent meetings and negotiations are necessary.
7. Time Impact Analysis related to Contract Time extension and/or the Change Order work shall be incorporated into and attached to the applicable Change Order Document(s).

F. RESPONSIBILITY FOR COMPLETION

The Contractor shall furnish sufficient forces, offices, facilities and equipment, and shall work such hours including night shift and overtime operations, as necessary to ensure the prosecution of the Work in accordance with the current monthly Construction Schedule Update. If, in the opinion of the Owner, the Contractor falls behind in meeting the Construction Schedule as presented in the current monthly Schedule update, the Contractor shall take such steps as may be necessary to improve its progress, and the County may require It to increase the hours of work, the number of shifts, overtime operations and/or the amount of construction plant and equipment without additional cost to the Owner.

G. PERFORMANCE MONITORING

1. The Owner may elect throughout or at any time during the Project to record the number of workers and construction equipment working on each schedule activity in each area of the Project and give a copy of this log to the Contractor who shall be responsible for advising the Owner, without additional cost to the Owner, of any error in this work history, in writing, within seven (7) calendar days of receipt
2. This information will be used by the Owner in its evaluation of the adequacy of the contractor's performance and on-site manpower staffing, as well as in the evaluation of any Contractor claims.

END OF SECTION 01310 CONSTRUCTION SCHEDULES

SECTION 01340

SHOP DRAWINGS PRODUCT DATA AND SAMPLES

PART 1 GENERAL

1.01 DESCRIPTION

- A. Submittals.
 - 1. Shop drawings.
 - 2. Product or catalog data.
 - 3. Samples.
- B. Related work specified elsewhere.
 - 1. Operating and maintenance manuals.
 - 2. Spare parts or hardware lists.
 - 3. Tests and certificates.

1.02 DEFINITIONS

- A. Shop drawings
 - 1. Original drawings prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate some portion of the work; showing fabrication, layout, setting or erection details.
 - 2. Identify details by reference to sheet and detail numbers shown on Contract Drawings.
- B. Product or catalog data.
 - 1. Manufacturers standard drawings modified to delete non applicable data or include applicable data.
 - 2. Manufacturers catalog sheets, brochures, diagrams, schedules, charts, illustrations or other descriptive data. Mark each copy to identify pertinent dimensions, materials, products or models.
- C. Samples.

1. Physical examples to illustrate materials, equipment or workmanship.
2. Office samples to show functional characteristics of product or material. Submit with full range of colors available.
3. Field samples and mock-up; erect at site in location acceptable to the Owner.

1.03 CONTRACTORS RESPONSIBILITIES

A. Prior to submittal.

1. Review and approve Shop Drawings, Product Data and Samples prior to submission to the Owner.
2. Coordinate each submittal with work of the project and Contract Documents so as to cause no delays in the work.
3. By approving and submitting Shop Drawings, Product Data and Samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.
4. The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Owner's acceptance unless the Contractor has specifically informed the Owner in writing of such deviation at the time of submission and the Owner has given written acceptance to the specific deviation.
5. Contractor's responsibility for errors and omissions in submittals or deviations; from Contract Documents is not relieved by the Owner's review of submittals.
6. The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the Owner on previous submittals.

B. After submittal

1. Begin no work which requires submittals until return of such submittals with the Owner's stamp and signature indicating review.

2. Distribute copies of submittals to subcontractors, suppliers or manufacturers as their interests appear.

1.04 IDENTIFICATION OF DATA

A. All submittals for review shall have the following identification data, as applicable, contained thereon or permanently adhered to.

1. Project name and location.
2. Specification number.
3. Subcontractor's, vendor's, and/or manufacturer's name, address and phone number.
4. Product identification.
5. Shop drawing title, Contractor's drawing number, and date of drawing and revisions.
6. Applicable contract drawings and specification section numbers.
7. Contractor's approval, signature and date:

B. Submittal Format.

Submittal No. _____

Project Name _____

Specification No. _____

Product _____

Section No. _____

Supplier: _____

We have reviewed the submitted, and have verified that it meets the criteria required in accordance with the plans and specifications.

Contractors Name _____

Signature _____

Title _____

C. Catalog data.

1. Each separate catalog, brochure or single page data sheet submitted shall have the identification required and the Contractor's approval.
2. Catalogs or brochures containing multiple items for review need identification only on the cover. Identify page numbers and catalog items.
3. In the event that one or more of the multiple items are not accepted in any submittal, additional copies required will not be required until all items are accepted.

1.05 COLOR AND FINISH SELECTION

A. Contractor submittals.

1. Submit as soon as practical, subsequent to award of contract, names of manufacturers and pertinent products or materials proposed for use in which the color selection is required.
2. Submit standard color charts or samples as requested by the Owner. All items for color selection must be submitted prior to issuance of any approvals.
3. Contractor is responsible for submitting products that comply with technical specifications.

1.06 SUBMISSION REQUIREMENTS

A. Submit all shop drawings, product or catalog data and samples to the Owner by transmittal containing identification of project, specifications number and identification of items being submitted.

B. Product data.

1. Original submittal. Six (6) copies of all shop drawings and/or product data for review in ample time to coordinate necessary features of construction with all fabrication and installation requirements.
2. Re-submittal. When required, copies will be returned to Contractor. After revision submit new copies as stipulated for original submittal. Indicate all changes.

C. Samples.

1. Original submittal. Furnish three (3) samples, unless otherwise prior to delivery of material to project site. Such samples shall be representative of actual material proposed for use in project and of sufficient size to demonstrate design, color, texture, and finish.
2. Re-submittal. All rejected samples will be returned upon request. All re-submittals shall consist of three (3) samples.

1.07 REVIEW AND PROCESSING

A. General.

1. The Owner will review and accept or take other appropriate action upon Contractor's submittals for conformance with the design concept of the work and with the information given in the Contract Documents. Acceptance of a specific item shall not indicate acceptance of an assembly of which the item is component.
2. Submittals not approved by the Contractor will be returned to Contractor. Submittals will not be reviewed or accepted by the Owner or Architect without Contractor's prior approval.

B. Review.

1. Product data. After review, two (2) copies bearing the Owner's review stamp and signature will be returned to Contractor.
2. Samples. After review one (1) sample will be returned and the remainder will be retained by the Owner until completion of work.

END OF SECTION 01340 SHOP DRAWINGS PRODUCT DATA AND SAMPLES

SECTION 01370

SCHEDULE OF VALUES

PART 1 GENERAL

1.01 DESCRIPTION

- A. Submit to the Owner, six (6) copies of an accurate and realistic Schedule of Values allocated to the various portions of the work, fifteen (15) days following award of contract.
- B. The Schedule of Values, unless objected to by the Owner, shall become the basis for the Contractor's applications for payment.
 - 1. Upon request by the Owner, support values given with data that will substantiate their correctness.
- C. Related requirements specified elsewhere.
 - 1. Section 01010, "Project General Requirements".

1.02 FORM OF SUBMITTAL

- A. Type schedule on 8-1/2" x 11" white bond paper. Identify schedule with:
 - 1. Title of project and location.
 - 2. Specification number.
 - 3. Name and address of Contractor.
 - 4. Date of submission.
- B. Schedule shall list the installed value of the component parts of the work in sufficient detail to serve as a basis for computing values for progress payments during construction.
- C. Use the Table of Contents of the project specifications as a basis for the format for listing component items.
 - 1. Identify each line item with the number and title of the respective section of the specifications.

- D. List sub-values of major products or operations for each line item. Additional sub-values may be requested by the Owner.
- E. Costs for the various portions of the work:
 - 1. Each item shall include a directly proportional amount of the Contractor's overhead and profit:
 - 2. For items on which progress payments will be requested, list the total installed value, including Contractor's overhead and profit.
- F. A similar detailed schedule, itemizing costs and/or credits in a form satisfactory to the Owner, shall accompany all quotations for changes in the work or for extra work. Refer to article entitled "Provisions for Extras" in the General Conditions of the project specifications.
- G. Round off figures to nearest ten (\$10) dollars wherever possible.
- H. The sum of all values listed in the schedule shall equal the total contract sum.

1.03 REVIEW AND RESUBMITTAL

- A. After review by the Owner, revise and resubmit Schedule as required. Resubmit revised Schedule in same manner.
- B. Progress payments will not be made until Schedule has been approved.

END OF SECTION 01370 SCHEDULE OF VALUES

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.01 DESCRIPTION

- A. Tests
- B. Inspections
- C. Owner will employ and pay for the services of an Independent Testing Laboratory or Geotechnical Engineer to perform specified testing and/or inspections.
- D. Related requirements specified elsewhere:
 - 1. Refer to the various trade sections for specific test and inspection requirements.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. Riverside County Building Code; latest edition.
- B. California Uniform Building Code Standards, as applicable.

1.03 QUALITY ASSURANCE

- A. General Test Requirements. Materials to be furnished under the Contract are subject to testing and inspection by the Owner for compliance with requirements of the Drawings and Specifications.
- B. Testing laboratory or agency shall be the licensed testing laboratory or agency meeting the requirements of ASTM E-329, designated by the Owner and referred to hereafter as the testing laboratory. Perform all testing under supervision and control of a California registered professional engineer employed by the Testing Laboratory.
- C. Geotechnical engineer will be a registered professional geotechnical engineer employed and paid by the Owner.
- D. Disqualified Material. Any material shipped or delivered to the site by the Contractor from the source of supply prior to having satisfactorily passed the required testing and inspection, or prior to the receipt of a notice from

the Owner or Architect that such testing and inspection will not be required, shall not be incorporated in the Work.

1.04 QUALITY CONTROL

A. Earthwork.

1. Approval of fill material.
2. Compaction tests.
3. Inspection of subgrades and excavations.

B. Concrete.

1. Materials.
 - a. Concrete aggregates
 - b. Reinforcing bars.
2. Concrete quality.
 - a. Concrete mix designs.
 - b. Strength tests of concrete cylinders made by Owner inspector and tests by approved lab.
3. Concrete inspection.
 - a. Job site inspection by Department inspector.
 - b. Weighmaster inspection/certificate.

C. Masonry.

1. Materials.
 - a. Tests of brick or block masonry units.
 - b. Tests of mortar and grout materials.
 - c. Reinforcing steel bars.
2. Mortar and grout quality.
 - a. Strength tests for mortar and grout Owner inspector and tests by approved lab.
3. Masonry inspection.

- a. Job site inspection by Owner Inspector
- D. Structural steel and metal deck tests and inspections.
 - 1. Materials.
 - a. Material identification and certification.
 - b. Testing of unidentified material.
 - 2. Inspection of structural steel, light gauge steel deck, and welding.
 - a. Welding inspection (shop and field).

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials to be tested and/or inspected as specified in respective sections.

PART 3 - EXECUTION

3.01 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor shall cooperate with laboratory personnel, providing access to Work.
 - 1. Employment of the laboratory by the Owner shall in no way relieve Contractor's obligations to perform the Work of the Contract.
- B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
- C. Department shall furnish copies of product test reports as required.
- D. Furnish incidental labor and facilities:
 - 1. To provide access to Work to be tested.
 - 2. To obtain and handle samples at the project site or at the source of the product to be tested.
 - 3. To facilitate inspections and tests.
 - 4. For storage and curing of test samples.

- E. Notify Owner sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
 - 1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.
- F. The Owner shall make arrangements with a laboratory and Contractor shall pay for additional samples and tests required for Contractor's convenience.

3.02 FIELD QUALITY CONTROL

A. Tests.

- 1. Department will select an independent testing laboratory to conduct tests. Selection of material required to be tested shall be by the laboratory or Owner's representative and not by Contractor.
- 2. Contractor shall notify Owner in sufficient time in advance of manufacture of material to be supplied, which must by terms of the contract be tested, in order that the Owner may arrange for testing.
- 3. Owner will select and pay testing laboratory costs for all tests and inspection, except as provided elsewhere in this section.

B. Test Reports.

- 1. Three (3) copies of all test reports shall be forwarded to the Owner by the testing agency. Such reports shall include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Sample taken but not tested shall also be reported. Records of special sampling operations as required shall also be reported. The reports shall show that the material or materials were sampled and tested in accordance with the requirements of (Title 24) and with the approved specifications. Test reports shall show the specified design strength. They shall also state definitely whether or not the material or materials tested comply with requirements.

C. Verification of Test Reports.

- 1. Each testing laboratory shall submit to the Owner a verified report in duplicate covering all of the tests which were required to be by that laboratory during the progress of the project. Such report shall be furnished each time that Work on the project is suspended, covering

the tests up to that time, and at the completion of the project, covering all tests.

D. Inspection.

1. The Owner shall at all times have access for the purpose of the inspection to all parts of the Work and to the shops wherein the Work is in preparation, and the Contractor shall at all times maintain proper facilities and provide safe access for such inspection.
2. The Owner shall have the right to reject materials and workmanship which are defective, or to require their correction. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the Owner. If the Contractor does not correct such rejected Work within a reasonable time, fixed by written notice, the Owner may correct same and charge the expense to the Contractor.
3. Should it be considered necessary or advisable by the Owner at any time before final acceptance of the entire Work to make an examination of Work already completed by removing or tearing out the same, the Contractor shall on request promptly furnish all necessary facilities, labor, and materials. If such Work is found to be defective in any respect due to fault of the Contractor or his Subcontractor, he shall defray all expenses of such examinations and of satisfactory reconstruction. If, however, such Work is found to meet the requirements of the Contract, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor.
4. Reimbursement of Inspection Costs. Contractor shall reimburse the Owner all or any part, of the actual excessive inspection costs incurred by the Owner due to any or all of the following:
 - a. Contractor's failure to complete the Work within the Contract time and any previously authorized extensions thereof.
 - b. Claims between separate Contractors. .
 - c. Covering any of the Work before the required inspections or tests are performed.
 - d. Extra inspections required for Contractor's correction of defective Work.
 - e. All costs incurred due to test failure, cost of failed test, and all other retest requirements.

E. Inspector.

1. An Inspector employed by the Owner will be assigned to the Work.
2. The Work of construction in all stages of progress shall be subject to the personal observation of the inspector. He shall have free access to any or all parts of the work at any time. The Contractor shall furnish the inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the Work and the character of the materials. Inspection of the Work shall not relieve the Contractor from any obligation to fulfill this Contract.
3. The Contractor shall be responsible to ensure that all Work is installed in compliance with the plans and specifications prior to requesting an inspection.

F. Inspector's Field Office.

1. The Contractor shall provide a temporary field office for the inspector in accordance with requirements specified in Section 01500, "Temporary Facilities."

END OF SECTION 01400 QUALITY CONTROL

SECTION 01500

TEMPORARY FACILITIES

PART 1 GENERAL

1.01 DESCRIPTION

- A. Office (1.02) **CONTRACTORS OPTION – NOT REQUIRED**
- B. Storage structure (1.03)
- C. Telephone, fax machine, and copy machine (1.04)
- D. Toilets (1.05)
- E. Protection from weather (1.06)
- F. Utilities (1.07)
- G. Dust barriers (1.08)
- H. Temporary chain link fence (1.09)
- I. Temporary walkways and driveways (1.10)
- J. Storage of materials (1.11)
- K. Parking (1.12)
- L. Staging Area (1.13)
- M. Construction signboard (1.14)

1.02 OFFICE – **CONTRACTORS OPTION**

- A. Contractor shall provide and maintain a watertight office on the premises where directed, for use of Contractor, and subcontractors. Office shall be painted, heated/air conditioned, provided with operating screened windows, doors with locks, a 5'-0" wide desk with drawers, plan table, plan rack, bookcase, shelf, a minimum three (3) drawer file cabinet, and at least ten (10) chairs. Provide one (1) conference room. Provide a conference table 36" x 96;"

- B. Contractor shall provide and maintain a watertight office of not less than 150 square feet on the premises where directed, for use of the Owner. Office shall be painted, heated/air conditioned, provided with operating screened windows, doors with locks, two 5'-0 wide desk with drawers, plan table, plan rack, bookcase, shelf, a minimum four (4) drawer file cabinet, and at least six (6) chairs. Contractor shall also provide hot and cold water dispenser with 5 gallon portable water supply, minimum 10 bottles per month. Provide one (1) conference room and one (1) private room in temporary office not less than 150 square feet. Provide a 5'-0 wide desk with drawers, bookcase, shelf, a minimum four (4) drawer file cabinet for private room. Provide a conference table, 36" x 96" and six (6) chairs.

1.03 STORAGE STRUCTURE

Contractor shall provide and maintain on the premises, where directed, watertight storage structure for all materials, which might be damaged by weather, including storage facilities for concrete test samples or other material samples required.

1.04 TELEPHONE, FAX MACHINE, COPY MACHINE, AND DESKTOP COMPUTER

- A. Contractor shall provide at his own expense one (1) non-pay telephone limited to local calls at his expense. Telephones shall be provided with bells located outside of field office. Local calls are considered to be those within the 805, 661, 213, 310, 323, 562, 626, 714, 949, 818, and 909 area codes.
- B. The Contractor shall provide a standard business fax/copy machine for communication with Owner representatives, project architect/engineer, and other project issues.
- C. The Contractor shall provide a desktop computer and printer with internet access for communication with Owner representatives, project architect/engineer, and other project issues.

1.05 TOILETS

Contractor shall install and maintain in a sanitary condition, suitable chemical toilets for use of workers. Toilets shall be in a location approved by the Owner. There shall be a minimum of one (1) toilet for each multiple of twenty (20) Contractor's employees, or fractional part thereof, working at the job site. Contractor shall not use existing toilets at the job site.

1.06 PROTECTION FROM WEATHER

The existing building structure and interior finish and furnishings shall be protected from rain, dew, wind, and all other elements of the weather during periods when roof areas are unprotected by roofing or when breaches are present in exterior

walls. Such areas shall be covered with weather tight tarpaulins or roofing materials firmly secured or by other approved methods. Refer to General Conditions. When, in the opinion of the Owner, breaches in roof or wall areas afford access to unauthorized persons, the Contractor shall, at no additional expense to the Owner, construct at such breaches, substantial barricades of type and material as approved by the Owner.

1.07 UTILITIES

The Contractor shall arrange for and provide all utility services necessary to the Work, including electrical current for power and light and water supplies, or at Contractor's option, he may use free of charge, available v utility services as may exist on the site. Motors connected to Owner electrical circuits shall not exceed 1/3 horsepower. Contractor shall provide, maintain, and remove upon completion of Work, all temporary connecting lines to sources of supplies, temporary meters, and accessories as needed.. The Contractor shall bear all expenses involved in the provisions of providing and connecting all temporary utility services. The Owner will assume payment for utility service charge at the time the various permanent meters are set. Refer to Project General Requirements section for permanent utility services.

1.08 DUST BARRIERS

Dust barriers shall be set up around all dust-producing operations to prevent contamination of the remainder of the facility.

1.09 TEMPORARY FENCING

A. TEMPORARY CHAIN-LINK FENCE

The Contractor shall provide and erect at each construction site an 6'-0" high temporary chain-link fence and all necessary gates. The chain link fence and gates shall be maintained during the duration of the project and promptly removed by the Contractor upon approved completion by the Owner. The Owner's representative must be given a key to the padlock on the gate for access to the site if the contractor is not present.

1.10 TEMPORARY WALKWAYS AND DRIVEWAYS

A. All new temporary walkways shall be properly joined or tied in with existing walkways. All permanent walkways shall consist of concrete.

B. Areas where temporary walkways or driveways have been installed shall be returned to their condition prior to construction.

1.11 STORAGE OF MATERIALS

Storage of materials shall be only within areas designated by the Owner.

1.12 PARKING

Contractor and employees shall be restricted to parking onsite or as approved by the Owner.

1.13 STAGING AREA

The staging area will be determined by the Owner prior to construction.

1.14 CONSTRUCTION SIGNBOARD

Refer to article entitled "Advertising" of the General Conditions. Prior to any ground breaking operation or in the case ground breaking is not required, within ten (10) days after award of contract, the Contractor shall furnish and erect an identification signboard 8'-0 x 8'-0 in size, constructed of 3/4" exterior grade plywood within a frame, supported on posts, and adequately braced to resist wind stresses. The sign background shall be painted with two (2) coats of exterior type paint over a suitable primer and lettered with block letters professionally applied. The signboard shall set forth, in sequence, the following information with the layout as directed by the Owner.

Sierra North Park Project
Canyon Lake Property Owners Association
Eric Kazakoff, General Manager, CLPOA
Cornerstone Studios, Inc., Landscape Architect
Name of Contractor

In addition, individual signs of Contractors, subcontractors and material men may be displayed as approved.

The size, construction, subject matter and location of all signs shall be subject matter and location of all signs shall be subject to the approval of the Owner.

Signs shall be promptly removed by the Contractor or by the Owner, if individually owned, upon completion of the work. The contractor shall be responsible to fill post holes, float surface level to new grade, and repair/reseed surface as approved.

END OF SECTION 01500 TEMPORARY FACILITIES

SECTION 01537

TREE PROTECTION

PART 1 GENERAL

1.01 DESCRIPTION

- A. The work specified in this Section consists of protecting trees which are within the Limits of Construction, Permanent Drainage Easements, Permanent Needs Line, and Temporary Construction Easement Lines and which are indicated to remain. Remove trees which have been damaged, as determined by the County or its authorized representative, and furnish and install replacement trees and shrubs.

1.02 TREE SPECIALIST

- A. All tree protection and maintenance, including watering, pruning, fertilizing, and pest control, shall be done by or under the supervision of a licensed Arborist or equally qualified Tree Specialist to be approved by the Owner or its authorized representative.

1.03 SUBMITTALS

- A. Before the beginning of any construction activities, submit to the Owner for approval a drawing showing locations of plants to be protected in place, and the proposed method of protection. Provide estimated height, caliper, and two photographs of each plant to be protected, clearly showing the structure and appearance of each plant.

1.04 GUARANTEE

- A. Trees protected in place shall be guaranteed as to acceptable growth, appearance, and health through the construction period, and for a period of one year after the beginning of maintenance.

PART 2 PRODUCTS

2.01 WATER - Potable

2.02 FENCING MATERIALS

Contractor's selection with Owner or its authorized representative's acceptance.

2.03 STRAW, HAY AND SOD

- A. Provide clean material, free from debris, noxious weeds, and ingredients, insects and pest detrimental to plant growth.

PART 3 NOT USED

END OF SECTION 01537 TREE PROTECTION

SECTION 01600

TRANSPORT. HANDLING & STORAGE

PART 1 GENERAL

1.01 DESCRIPTION (PREPARATION FOR SHIPMENT)

A. Shop prime:

1. Structural steel surfaces not to be encased in concrete shall be shop primed with specified primer. Refer to Section 05120 - "Structural Steel" for primer.
2. After factory tests and acceptance, machined and/or polished surface to remain unpainted shall be coated with minimum 2 mil thickness of rust preventive compounds, or as recommended by manufacturer.

B. Protection:

1. Protect steel surfaces to ensure that their cleanliness during shipment, storage and erection.
2. Protect structural steel against damage from all sources whether mechanical, chemical or environmental.

1.02 TRANSPORTATION AND HANDLING

1. Verification of intent to ship, arrival date and cartage company must be made known to Owner by Contractor.
2. Immediately on delivery, a complete and thorough inspection of the structural steel by Owner and Contractor shall be made. Any damages incurred in shipping or handling shall be replaced promptly by Contractor at no cost to the Owner.

1.03 STORAGE AND PROTECTION

1. Storage and protection shall be the responsibility of the Contractor.
2. Provide complete weather protection for stored structural steel. Storage must be in Riverside County, and all material must be insured.

3. Inspection of stored structural steel to assure it will be free from damage or deterioration shall be provided at no additional cost.
4. All storage, handling and re-handling costs, insurance and responsibility for protection and proper installation of such material is the obligation of the Contractor. No payment, pursuant to this provision for material shall in any way relieve the Contractor of its responsibility to obtain or provide, at its expense, any such material or release the Contractor from any of its obligations under this Contract.
5. Department may enter upon the premises where the material is stored for inspection, checking, or any other purpose he deems necessary.
6. The Contractor will be reimbursed for any Riverside County taxes levied against such material while so stored, upon presentation of the receipted tax bill for same.
7. Contractor must furnish with his Request for Payment acceptable evidence showing such material has been paid for in full, together with a verified statement that same is/are free from liens and encumbrances and will be utilized in the work covered by this Contract and a material list sufficient for physical inventory at the storage location.

END OF SECTION 01600 TRANSPORT HANDLING & STORAGE

SECTION 01640

PRODUCT HANDLING AND PROTECTION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Transport, deliver, handle, and store materials and equipment at the job site in such manner as *to* prevent damage, including damage which might result from the intrusions of foreign matter or moisture from any source. Comply with:
1. Material and equipment manufacturer's instructions regarding temperature limitations.
 2. Other environmental conditions which are required *to* maintain the original quality of the materials and equipment.
 3. Handle materials to prevent damage *to* products and finishes.
- B. Packaging:
1. Maintain packaged materials in manufacturer's original containers with seals unbroken and labels intact until they are incorporated into the Work.
 2. Packaged material shall bear the name of the manufacturer, the product, including brand name, color, stock number and all other complete identifying information.
- C. Storing:
1. Locate storage piles, stacks or bins so as *to* avoid being disturbed. Provide barricades as required *to* protect storage from damage.
 2. Store all materials and equipment according to manufacturer's instructions, above grade, and properly protected from weather and construction activities.
- D. Protection:
- I. Protect all' finished surfaces, including jambs and soffits of all openings used as passage-ways through which materials and equipment are handled.

2. Provide protection for all finished flooring surfaces in traffic areas before allowing any materials and equipment *to* be moved over those finished surfaces.
3. Maintain all finished surfaces clean, unmarred and suitably protected until occupied by Owner.

E. Repairs and Replacements:

1. In event of damage, promptly make replacements and repairs *to* the satisfaction of the Owner and at no additional cost *to* the Owner.

END OF SECTION 01640 PRODUCT HANDLING AND PROTECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specifications, apply to this section.

1.02 SUMMARY

- A. This section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Project record document submittal.
 - 3. Operation and maintenance manual submittal.
 - 4. Submittal of warranties.
 - 5. Final cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate sections.

1.03 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request:
 - 1. In the application for payment that coincides with, or first follows, the date substantial completion is claimed, show one hundred (100) percent completion for the portion of the Work claimed as substantially complete.
 - a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the contract sum.

- b. If one hundred (100) percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
 2. Advise the Owner of pending insurance changeover requirements.
 3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
 4. Obtain and submit releases enabling the owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 5. Submit record drawings, maintenance manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
 6. Deliver tools, spare parts, extra stock, and similar items.
 7. Make final changeover of permanent locks and transmit keys to the owner. Advise the Owner's personnel of changeover in security provisions.
 8. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mock-ups, construction tools, and similar elements.
 9. Complete final cleanup requirements, including touch-up painting.
 10. Touch up and otherwise repair and restore marred, exposed finishes.
- B. Inspection Procedures: On receipt of a request for inspection, the architect will either proceed with inspection or advise the Contractor of unfilled requirements. The architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be Issued.
1. The architect will repeat inspection when requested and assured that the Work is substantially complete.
 2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.04 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request:
1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
 2. Submit an updated final statement, accounting for final additional changes to the contract sum.
 3. Submit a certified copy of the architect's final inspection list of items to be completed or corrected, endorsed, and dated by the architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the architect.
 4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the owner took possession of and assumed responsibility for corresponding elements of the Work.
 5. Submit consent of surety to final payment.
 6. Submit a final liquidated damages settlement statement.
 7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Re-inspection Procedure: The architect will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the architect.
1. Upon completion of re-inspection, the architect will prepare a certificate of final acceptance. If the Work is incomplete, the architect will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled, but are required for final acceptance.
 2. If necessary, re-inspection will be repeated.

1.05 RECORD DOCUMENT SUBMITTALS

- A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant

location. Provide access to record documents for the architect's reference during normal working hours.

- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
 2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
 3. Note related Change-Order numbers where applicable.
 4. Organize record drawing sheets into manageable sets. Bind sets with durable- paper cover sheets and print suitable titles, dates, and other identification on the cover of each set.
- C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda. Include with the Project Manual one (1) copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.
1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
 2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
 3. Note related Record Drawing information and product data.
 4. Upon completion of the Work, submit record Specifications to the architect for the Owner's records.
- D. Record Product Data: Maintain one (1) copy of each product data submittal. Note related Change Orders and markup of Record Drawings and Specifications.

1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
 2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
 3. Upon completion of markup, submit complete set of record product data to the architect for the owner's records.
- E. Record Sample Submitted: Immediately prior to Substantial Completion, the Contractor shall meet with the architect and the owner's personnel at the Project site to determine which samples are to be transmitted to the owner for record purposes. Comply with the Owner's instructions regarding delivery to the owner's sample storage area.
- F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the architect for the owner's records.
- G. Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch, 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:
1. Emergency instructions.
 2. Spare parts list.
 3. Copies of warranties.
 4. Wiring diagrams.
 5. Recommended "turnaround" cycles.
 6. Inspection procedures.
 7. Shop Drawings and product data.

8. Fixture lamping schedule.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.01 CLOSEOUT PROCEDURES

- A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
 1. Maintenance manuals.
 2. Record documents.
 3. Spare parts and materials.
 4. Tools.
 5. Lubricants.
 6. Fuels.
 7. Identification systems.
 8. Control sequences.
 9. Hazards.
 10. Cleaning.
 11. Warranties and bonds.
 12. Maintenance agreements and similar continuing commitments.
- B. As part of instructions for operating equipment, demonstrate the following procedures:

1. Startup.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.02 FINAL CLEANING

- A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 1, Section 01710, "Cleaning."
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.
 - a. Remove labels that are not permanent labels.
 - b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
 - c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 - d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

- e. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean and remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the project of rodents, insects, and other pests.
- D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.
- E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.
 - 1. Where extra materials of value remain after completion of associated Work, they become the owner's property. Dispose of these materials as directed by the Owner.

END OF SECTION 01700 CONTRACT CLOSEOUT

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Project Record Documents required include:
 - 1. Marked-up copies of Contract Drawings.
 - 2. Marked-up copies of Shop Drawings.
 - 3. Newly prepared Drawings.
 - 4. Marked-up copies of Specifications, Addenda and Change orders.
 - 5. Marked-up Product Data submittals.
 - 6. Record Samples.
 - 7. Field records for variable and concealed conditions.
 - 8. Record information on Work that is recorded schematically.

- B. Maintenance of Documents and Samples: Store record documents and samples in the field office apart from Contract Documents used for construction. Do not permit Project Record Documents to be used for construction purposes. Maintain record documents in good order, and in a clean, dry, legible condition. Make documents and Samples available at all times for inspection by the Architect.

1.02 RECORDING

- A. Record drawings shall include dimensions from not less than two permanent and salient building points.

- B. Post changes and modifications to the Documents as they occur. Do not wait until the end of the Project.

- C. The Architect will periodically review record documents to assure compliance with this requirement.

1.03 PROCEDURES

- A. Promptly following contract Award, General Contractor shall secure from the Owner one complete set of specifications and prints of the Contract Drawings and mark them as "Project Record Documents."
- B. Timing Of Entries: Make entries within 24 hours after receipt of information.

END OF SECTION 01720 PROJECT RECORD DOCUMENTS

SECTION 02100

SURVEY AND FIELD ENGINEERING

PART 1 GENERAL

1.01 DESCRIPTION

Under this section, the Contractor shall provide surveying and field engineering for the project. The Contractor shall employ, as necessary, the services of a Land Surveyor and a Professional Engineer licensed in the State of California.

Work Included

- A. Work under this section shall include but may not be limited to the following:
 - 1. Establish and maintain baselines and field control points as required for construction layout survey.
 - 2. Survey and measurement necessary to establish design lines and grades shown on the Contract Documents.
 - 3. Provide all basic site engineering to assure accurate locations and elevations for new construction.

1.02 SUBMITTALS

- A. The Contractor shall submit survey field notes, calculations, and any other pertinent information to the Engineer for verifying accuracy of survey work.
- B. Prior to completion of the project, the Contractor shall submit to the Engineer a copy of registered site drawing and certificate signed by the Land Surveyor or Professional Engineer as applicable, that the elevations and locations of the Work are in conformance with Plans.
- C. The Contractor shall submit all construction survey layout data and offset calculations to the Engineer as requested.

1.03 QUALITY CONTROL

- A. The Contractor shall maintain a complete and accurate log of control and survey work as it progresses.
- B. The Engineer reserves the option to check any or all of the Contractor's survey measurements and calculations. Whether the Engineer exercises this option or not, the requirement for accuracy will not be waived.

- C. On completion of construction and major site improvements, the Contractor shall prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION

- A. The Contractor shall verify locations of survey control points prior to starting work.
- B. The Contractor shall promptly notify Engineer of any discrepancies discovered.

3.02 SURVEYS AND RECORDS

- A. Working from lines and grades established by baseline survey as shown in relation to the Work, the Contractor shall establish and maintain bench marks and other dependable markers to set lines and levels for the Work on site as needed to properly locate each element of entire project.
- B. The Contractor shall calculate and measure required dimensions as shown (within recognized tolerances if not otherwise indicated). Plans shall not be scaled to determine the required dimensions. Immediately notify the Engineer or his designee of any discrepancies noted on the plans.
- C. The Contractor shall advise tradesmen performing the Work, of marked lines and grades provided for their use in layout of work.

3.03 SURVEY PROCEDURES

- A. The Contractor shall furnish skilled labor, instrument platforms, ladders and such other temporary structures, special lights or groups of lights as may be necessary for making and maintaining points and lines in connection with the surveys required.
- B. The Contractor shall verify layout information shown on Plans, in relation to baseline survey and existing bench marks, before proceeding with layout of actual work.
- C. As work proceeds, the Contractor shall check every major element for line, level and plumb (where applicable), and maintain an accurate surveyor's log

or record book of such checks, available for Engineer's reference.

- D. The Contractor shall record deviations from required lines and levels, and advise Engineer promptly upon detection of deviations exceeding indicated or recognized tolerances. Record deviations which are accepted (not corrected) on record Plans.

3.04 SURVEY REQUIREMENTS

- A. The Contractor shall establish or re-establish baselines and field control points as necessary. Provide all basic site engineering to assure accurate locations and elevations for construction.
- B. The Contractor shall provide field engineering services. Utilize recognized engineering survey practices.
- C. The Contractor shall establish elevations, lines and grades. The Contractor shall locate and lay out by instrumentation and similar appropriate means for the proposed works.
- D. The Contractor shall periodically verify layouts by same means.

3.05 SURVEY REFERENCE POINTS

- A. The Contractor shall locate and protect survey control and reference points, preserve permanent reference points during construction.
- B. Control datum for survey is that indicated on Plans.
- C. The Contractor shall promptly report to Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- D. The Contractor shall replace dislocated survey control points based on original survey control. No changes shall be made without prior written notice to Engineer.

PART 4 MEASUREMENT AND PAYMENT (NOT USED)

END OF SECTION 02100 SURVEY AND FIELD ENGINEERING

SECTION 02170

SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

- A. In accordance with pertinent provisions of this Section, carefully demolish and remove from the site those items scheduled to be so demolished and removed.

PART 2 PRODUCTS

(No products are required in this Section)

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 DEMOLITION

- A. By careful study of the Contract Documents, determine the location and extent of selective demolition to be performed.
- B. In company with the Owner, visit the site and verify the extent and location of selective demolition required.
 - 1. Carefully identify limits of selective demolition.
 - 2. Mark interface surfaces as required to enable workmen also to identify items to be removed and items to be left in place intact.
- C. Prepare and follow an organized plan for demolition and removal of items.
 - 1. Shut off, cap, and otherwise protect existing public utility lines in accordance with the requirements of the public agency or utility having jurisdiction.
 - 2. Completely remove items scheduled to be so demolished and

SELECTIVE DEMOLITION

02170-1

removed, leaving surfaces clean, solid, and ready to receive new materials specified elsewhere.

- D. Demolished material shall be considered to be property of the Contractor and shall be completely removed from the Project site, except items indicated by the Owner or listed on the Plans which are to be carefully removed from the existing site, cleared and protected, and stored on the site for pick-up by the Owner.
- E. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

3.03 REPLACEMENTS

- A. In the event of demolition of items not so scheduled to be demolished, promptly replace such items to the approval of the Owner and at no additional cost to the Owner.

PART 4 MEASUREMENT AND PAYMENT (NOT USED)

END OF SECTION 02170 SELECTIVE DEMOLITION

SECTION 31 20 00

GRADING

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.
- B. Comply with most current edition of the CBC and SPPWC "Green Book".

1.2 SUMMARY

- A. Provide all labor, materials and equipment as necessary to complete all work as indicated on the Drawings and specified herein.

- B. This Section includes:

DRAFT

- 1. Excavating and filling for rough grading the Site.
- 2. Preparing subgrades for walks, pavements, turf and grasses and plants.
- 3. Subbase course for concrete walks and pavements.
- 4. Subbase course and base course for paving.
- 5. Subsurface drainage backfill for walls and trenches.
- 6. Excavating and backfilling trenches for utilities and pits for buried utility structures.

- C. Related sections include the following:

- 1. Section 033000 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
- 2. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.

1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

- 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including

EARTH MOVING

- haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices or changes in the Work.
 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.
- I. Structures: Modular Block Retaining walls, slabs on-grade (excluding building), tanks, curbs, sewerage, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil

EARTH MOVING

materials.

- L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled low-strength material, including design mixture.
3. Warning tapes.

- B. Samples for Verification: For the following products, in sizes indicated below:

1. Warning Tape: 12 inches long; of each color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.

DRAFT

- B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 1557.

- C. Blasting plan; No blasting will be permitted.

- D. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

- A. Contractor shall be responsible for contacting the Owner's Geotechnical Testing Agency at those times required by the specifications for the appropriate materials and soils testing.

- B. Contractor shall coordinate with the Owner's Geotechnical Testing Agency as to the Testing Agency's requirements for advance notification but allow for a

EARTH MOVING

minimum 24-hours notification.

- C. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.7 PROJECT CONDITIONS

- A. Existing Utilities: Contractor shall not interrupt utilities serving facilities occupied by the Owner or others 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 fourteen (14) days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.
 - 3. Contractor shall contact utility-locator service DIG Alert for area where Project is located before excavating. A private utility locating service may be required for non-public utilities.
 - 4. Contractor shall demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.
- B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- C. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.
- D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified on plans are in place.
- E. 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 other digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- F. Do not direct vehicle or equipment exhaust towards protection zones.
- G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.
- H. Dewatering: Review requirements for dewatering with Owner during the design phase. Discharge from dewatering operations must meet with local and State National Pollutant Discharge Elimination System (NPDES) requirements.
- I. Explosives: Do not use explosives.

PART 2 - PRODUCTS

A. MATERIALS

1. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
 2. Satisfactory Soils: Soil Classification Groups GW, GP, GM, GC, SW, SP, ML, CL and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
 3. Unsatisfactory Soils: Soil Classification Groups OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
 - a. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- B. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; less than 3 percent stones 3/4-inch or larger in any dimension and roots, plants, sod, clay lumps, and other extraneous materials harmful to plant growth.
1. Where possible try to match sandy loam soil conditions with topsoil re-use or importing similar soil structure.
 2. Topsoil shall be free of all deleterious material that may adversely affect the use of the planted surface including any metal, wood, plastic, glass or other manmade materials not intended specifically as a soil supplement.
 3. Topsoil shall be free of obnoxious weeds and invasive plants or other undesirable organisms and disease-causing plant pathogens. Topsoil shall be free of chemicals and pesticides, farm crop seeds, with documentation

EARTH MOVING

- on topsoil origin and soil testing.
4. Topsoil particle sizes shall fall in the following ranges as percentages by mass both separately and in combination:
 - a. Clay: 35 percent to 60 percent
 - b. Silt: 35 percent to 60 percent
 - c. Sand: less than 60 percent
 - d. Silt and Clay in combination: less than 65 percent
- C. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth. Supplement with imported topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 6 inches deep; do not obtain from bogs or marshes.
- D. Topsoil Testing: Include specification to cover testing of topsoil (both from Owner and from offsite) and remediation of topsoil.
- E. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone; ASTM D 2940; conforming to State of California, Dept of Transportation Gradation CA-6 or CA-10.
- F. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone ASTM D 2940; conforming to State of State of California, Dept of Transportation Gradation CA-6.
- G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone; ASTM D 2940; conforming to State of State of California, Dept of Transportation Gradation CA-6 or CA-7.
- H. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; conforming to State of California, Dept of Transportation Gradation CA-11.
- I. Drainage Fill: Narrowly graded mixture of washed crushed stone, or washed crushed or uncrushed gravel; ASTM D 448; coarse-aggregate conforming to State of California, Dept of Transportation Gradation CA-14.
- 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 zero to 5 percent passing a No. 4 sieve.
- K. Sand: ASTM C 33/C 33M; fine aggregate.

L. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

M. Geotextiles:

1. General: Limit use of geo-textiles. Past experience and over-use has prevented adequate water/rainfall for plant absorption, created surface water collection and "ponding", and prevented optimal sub-surface drainage.

2. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

- a. Survivability: Class 2; AASHTO M 288.
- b. Grab Tensile Strength: 248 lbf; ASTM D 4632.
- c. Sewn Seam Strength: 223 lbf; ASTM D 4632.
- d. Tear Strength: 90 lbf; ASTM D 4533.
- e. Puncture Strength: 90 lbf; ASTM D 4833.
- f. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
- g. Water Flow Rate: 110 gpm minimum; ASTM D 4491
- h. Permittivity: 0.02 per second, minimum; ASTM D 4491.
- i. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

3. Separation Geotextile: Nonwoven needle punched geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

- a. Survivability: Class 1; AASHTO M 288.
- b. Grab Tensile Strength: 315 lbf; ASTM D 4632.
- c. Sewn Seam Strength: 284 lbf; ASTM D 4632.
- d. Tear Strength: 113 lbf; ASTM D 4533.
- e. Puncture Strength: 113 lbf; ASTM D 4833.
- f. Apparent Opening Size: No. 70 sieve, maximum; ASTM D 4751.
- g. Water Flow Rate: 110 gpm minimum; ASTM D 4491
- h. Permittivity: 0.02 per second, minimum; ASTM D 4491.
- i. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

N. Controlled Low-Strength Material:

1. Controlled Low-Strength Material: Low-density, self-compacting, flowable concrete material as follows:

- a. Portland Cement: ASTM C 150, Type I.
- b. Fly Ash: ASTM C 618, Class C or F.

- c. Normal-Weight Aggregate: ASTM C 33/C 33M, 3/8-inch nominal maximum aggregate size.
 - d. Fine Aggregate: Sand IDOT Gradation FA-1 or FA-2.
 - e. Foaming Agent: ASTM C 869.
 - f. Water: ASTM C 94/C 94M.
 - g. Air-Entraining Admixture: ASTM C 260.
 - h. Compressive Strength: Minimum 30 psi at 28 days and 150 psi at 180 days when tested according to ASTM C 495.
- O. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 4 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
- 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.

PART 3 - EXECUTION

DRAFT

A. PREPARATION

- 1. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- 2. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- 3. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

B. DEWATERING

- 1. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- 2. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - a. 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.

C. EXCAVATION, GENERAL

1. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - a. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 - b. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - 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.
2. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Engineer. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
 - a. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - 1) Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
 - b. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:

- 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.

D. EXCAVATION FOR WALKS AND PAVEMENTS

1. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

E. EXCAVATION FOR UTILITY TRENCHES

1. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - a. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
2. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 - a. Clearance: 12 inches each side of pipe or conduit or as indicated on the plans.
3. 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.
 - a. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - b. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
 - c. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
 - d. Excavate trenches 6 inches deeper than elevation required in rock or

other unyielding bearing material to allow for bedding course.

4. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
 - a. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
5. Trenches in Tree- and Plant-Protection Zones:
 - a. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 - b. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
 - c. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

F. SUBGRADE INSPECTION

1. Notify Engineer when excavations have reached required subgrade.
2. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
3. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - a. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 - b. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.
4. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

G. UNAUTHORIZED EXCAVATION

1. Fill unauthorized excavation under foundations or wall footings by extending
EARTH MOVING

bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Engineer.

- a. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

H. STORAGE OF SOIL MATERIALS

1. Stockpiles borrow soil materials and excavate satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - a. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

I. BACKFILL

1. See Project Geotechnical Soil Report.
2. Place and compact backfill in excavations promptly, but not before completing the following:
 - a. Construction below ~~finish~~ grade including, where applicable, subdrainage, damp proofing, waterproofing, and perimeter insulation.
 - b. Surveying locations of underground utilities for Record Documents.
 - c. Testing and inspecting underground utilities.
 - d. Removing concrete formwork.
 - e. Removing trash and debris.
 - f. Removing temporary shoring, bracing, and sheeting.
 - g. Installing permanent or temporary horizontal bracing on horizontally supported walls.
3. Place backfill on subgrades free of mud,

J. UTILITY TRENCH BACKFILL

1. See Project Geotechnical Report.
2. Place backfill on subgrades free of mud.
3. 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.
4. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."
5. Trenches under Roadways: Install pipe and backfill per utility owner's requirements. Install Low Strength Concrete (flowable fill) per Green Book requirements up to the bottom of subbase.
6. Backfill voids with satisfactory soil while removing shoring and bracing.
7. Initial Backfill:
 - a. Soil Backfill: Place and compact initial backfill of subbase material or satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
 - 1) Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
 - b. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.
8. Final Backfill:
 - a. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
 - b. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.
9. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

K. SOIL FILL

1. See Project Geotechnical Report

L. SOIL MOISTURE CONTROL

1. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - a. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - b. 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.

M. COMPACTION OF SOIL BACKFILLS AND FILLS

1. See Project Geotechnical Report
2. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
3. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
4. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - a. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 - b. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
 - c. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
 - d. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

N. GRADING

1. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

- a. Provide a smooth transition between adjacent existing grades and new grades.
 - b. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
2. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
 - a. Turf or Unpaved Areas: Plus or minus 1 inch.
 - b. Walks: Plus or minus 1 inch.
 - c. Pavements: Plus or minus 1/2 inch.
 3. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

O. SUBSURFACE DRAINAGE

1. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 - a. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.
2. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 - a. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.
 - b. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

P. SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

1. Place subbase course and base course on subgrades free of mud.
2. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 - a. Install separation geotextile (where needed and as directed) on prepared subgrade according to manufacturer's written instructions,

EARTH MOVING

- overlapping sides and ends.
- b. Place base course material over subbase course under hot-mix asphalt pavement.
 - c. Shape subbase course and base course to required crown elevations and cross- slope grades.
 - d. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
 - e. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - f. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

DRAFT

Q. Field Quality Control:

1. Geotechnical Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
2. Testing agency will test compaction of soils in place according to ASTM D 1557, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
3. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 3500 sq. ft. or less of paved area or building slab, but in no case fewer than 2 tests.
4. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 250 feet or less of trench length, but no fewer than 1 test.
5. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, contractor shall scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.
6. Subgrade Inspection: Contractor shall notify Owner's Geotechnical Testing Agency when excavations have reached required subgrade. If Owner's Geotechnical Testing Agency determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
7. Proof-Rolling: Contractor shall proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Review requirements and additional compensation for authorized additional excavation and replacement material with Owner during the design phase.
8. Unauthorized Excavation: Fill unauthorized excavations under other construction or utility pipe as directed by Owner's Geotechnical Testing Agency.
9. Storage of Soil Materials: Contractor shall stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Contractor shall place, grade, and shape stockpiles to drain surface water and cover to prevent windblown dust. Contractor shall stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
10. Protection:
 - a. Protecting Graded Areas: Contractor shall protect newly graded areas from traffic and erosion. Keep free of trash and debris.
 - b. Contractor shall repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - c. Where settling occurs before Project correction period elapses, contractor shall remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

R. Hauling Routes:

1. Contractor must submit and have approved all planned hauling routes to the Owner to any site disturbance operations.

END OF SECTION 31 20 00
GRADING

DRAFT

SECTION 02230

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.
- B. Comply with most current edition of the CBC, SPPWC "GREEN BOOK".

1.2 SUMMARY

- A. Provide all labor, materials, and equipment as necessary to complete all work as indicated on the Drawings and specified herein.

- B. This Section includes: DRAFT
 - 1. Protecting existing vegetation to remain.
 - 2. Removing existing vegetation.
 - 3. Clearing and grubbing.
 - 4. Stripping and stockpiling topsoil.
 - 5. Removing above and below grade site improvements.
 - 6. Disconnecting, capping or sealing, and removing site utilities and/or abandoning site utilities in place.
 - 7. Temporary erosion and sedimentation control measures.

- C. Related sections include the following:

- 1. Division 31 Section "Earth Moving."

1.3 DEFINITIONS

- A. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in
EARTH MOVING

disturbed areas such as urban environments, the surface soil can be subsoil.

- C. Topsoil: Friable clay loam surface soil containing 2.5% to 12% organic matter. Topsoil shall be free of subsoil, clay lumps, stones, rocks, weeds, roots, construction debris, and other unsuitable materials as determined and approved by the Project Representative.
- D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

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

1.5 SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or videotape.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Inspect, maintain, and repair erosion and sedimentation-control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal. DRAFT

3.3 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.
 - 1. Arrange with utility companies to shut off indicated utilities.
- B. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than three days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.
- D. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. A Preconstruction Meeting is required prior to land disturbance activities. This meeting shall include at least Owner's Grounds Manager and/or Landscape Architect. Existing conditions of vegetation to remain will be documented and kept in the construction trailer.
 - 2. See Section 329300 – Plants for maintenance and protection requirements.
 - 3. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 4. Contractor shall repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Owner's Grounds Manager or Landscape Architect.
 - 5. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
 - 6. Use only hand methods for grubbing within protection zones.
 - 7. Chip removed tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

DRAFT

3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
 - 2. Inspection of topsoil by Grounds Manager and/or Landscape Architect is required.
- C. Stripping and stockpiling topsoil shall be done under reasonably dry conditions. Stripping and stockpiling under wet conditions will not be allowed.
- D. Contractor shall strip available topsoil to its full depth from within the Contract limits, excluding areas in close proximity to trees designated to remain, unless otherwise specified or directed by the Project Representative.
- E. Contractor shall stockpile topsoil in a storage pile in an area shown on the

EARTH MOVING

Drawings or as directed by the Project Representative. Storage pile shall be shaped to freely drain surface water during and after stockpiling operations. Excess topsoil shall be hauled by the Contractor and stockpiled on the Owner's property as directed by the Project Representative. The stockpile shall be protected from soil and sediment erosion as required elsewhere in these Specifications.

- F. Contractor shall limit height of topsoil stockpiles to 72 inches.
- G. Contractor shall not stockpile topsoil within the dripline of trees to remain.

3.6 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut a long line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31

SECTION 02500

AGGREGATE BASE COURSE

PART 1 GENERAL

1.01 DESCRIPTION

- A. The work includes constructing crushed aggregate base course beneath all new pavement.

1.02 STANDARD SPECIFICATIONS

- A. All work to be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction, latest edition and supplements.
- B. The Contractor shall have one copy of the Standard Specifications at the job site.
- C. The Standard Specifications apply only to performance and materials and how they are to be incorporated into the work. The legal/contractual relationship sections, and the measurement and payment sections do not apply to this document.

PART 2 PRODUCTS

2.01 BASE COURSE

- A. Base course shall conform with the requirements for crushed aggregate base as specified in Section 200-2.2 of the Standard Specifications.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Base course shall be placed and compacted in conformance with Section 301-2 of the Standard Specifications.

END OF SECTION 02500 AGGREGATE BASE COURSE

SECTION 02510

ASPHALTIC CONCRETE PAVING

PART 1 GENERAL

1.01 DESCRIPTION

- A. The Work specified in this Section consists of furnishing and placing asphalt concrete pavement to the thicknesses, lines and grades indicated, and concrete wheel stops in accordance with the Standard Specifications for Public Works Construction (SSPWC).

1.02 STANDARD SPECIFICATIONS

- A. All work to be performed and materials to be used shall be in accordance with the Southern California Chapter American Public Works Association "Standard Specifications for Public Works Construction", latest edition and supplements.

1.03 QUALITY ASSURANCE

- A. Testing Agency: Owner will engage, at its expense, a Testing Agency to inspect asphaltic concrete paving, to perform tests specified, and to submit reports to Owner.
 - 1. Testing Agency will be responsible for conducting and interpreting tests, will state in each report whether or not test results comply with Contract Documents, will specifically note deviation there from, and will indicate corrective measures required and taken.
 - 2. Contractor shall provide Testing Agency with the following:
 - a. Test reports of materials incorporated in Work.
 - b. Proposed asphalt concrete pavement mix.
 - c. Time and place of plant mixing and Project Site paving operations.
 - d. Representative samples of material requested for testing.

1.05 PROJECT CONDITIONS

- A. Examine the area and conditions under which Work will be performed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected to the satisfaction of Owner or its designee.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Provide materials in accordance with SSPWC requirements unless otherwise noted.
- B. Aggregate Base Course: Size and gradation per contract drawings. ASTM C33, from approved source to ensure uniform quality and grading. Deliver so that moisture content variations will not decrease production of reasonably uniform concrete. Do not use aggregates that are reactive with alkalis.
- C. Asphalt Prime and Tack Coat: SSPWC Section 302-5.3 and 302-5.4.
- D. Asphaltic Concrete: SSPWC Section 203-6, Class and grade as indicated.
- E. Seal coat: SSPWC Section 203-3.
- F. All other materials to be manufacturer's standard for the items required or type best suited for the intended use.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine substrates, verify compaction of soil, adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Preparation
 - 1. Do not commence preparing of subgrade until underlying drains and other subsurface structures have been constructed and their trenches have been properly backfilled and compacted.
 - 2. Do not commence asphaltic concrete paving work until concrete curbs are constructed and cured.
 - 3. Maintain subgrade in satisfactory condition and properly drained, until pavement is placed thereon.

3.03 INSTALLATION

- A. Aggregate Base Course: Thickness as shown on construction drawings. Provide in accordance with SSPWC Section 301-2.
- B. Asphaltic Prime Coat: Thickness as shown on construction drawings. Provide in accordance with SSPWC Section 302-5.2.
- C. Asphalt Tack Coat: Provide in accordance with SSPWC Section 302-5.3.
- D. Asphaltic Concrete: Thickness as shown on construction drawings. Provide in accordance with SSPWC Section 203-6.
 - 1. Establish job Mix formula proposed for this Work.
 - 2. Compact by hand methods to produce required density in areas not accessible to rolling.
 - 3. Apply uniform tack coat, in accordance with SSPWC at rate of 0.05 to 0.10 gallons per square yard as directed where previously primed base course does not contain sufficient viscous qualities to secure proper surface course adhesion.
- E. Seal coat: Provide in accordance with SSPWC Section 302-8.

3.04 PATCHING

- A. Cut out and fill with fresh, hot asphaltic concrete. Remove deficient areas for full depth of surface and base course. Cut sides perpendicular and parallel and perpendicular to direction of traffic extent of failure. Apply tack coat to exposed surfaces before placing new pavement. Compact and finish to specification.

3.05 JOINING PAVING

- A. Carefully lay joints between existing and new pavements or between Work of successive days in a manner to ensure a continuous bond between existing and new Sections. Expose, clean, and cut edges to straight, vertical surfaces. Paint joints with a uniform coat of tack coat before the fresh mixture is placed.

3.06 CLEANING

- A. After completion of paving operations thoroughly clean paved areas by

sweeping or washing and remove defacements or stains. Exercise care to avoid soiling of adjacent construction. Remove such soiling prior to final acceptance of Work.

3.06 PROTECTION

- A. Protect finished surfaces against blemishes and disfigurement.
- B. Do not permit vehicular traffic on finished pavement until it has hardened sufficiently, and in no case less than 36 hours after completion.

3.07 FLOOD TEST

- A. All asphalt paving shall be given a flood test. All asphalt work where water ponds and does not run off shall be removed and replaced to provide proper drainage.

END OF SECTION 02510 ASPHALTIC CONCRETE PAVING

SECTION 02527

PERMEABLE AGGREGATE AND POROUS ASPHALT PAVING

PART 1 GENERAL

1.01 DESCRIPTION:

- A. Include all labor, material, transportation and services to complete installation of the permeable aggregate base and the porous asphalt paving as shown on the drawings for the parking area.
 - 1. Final sub-grade establishment
 - 2. Structural soil-bearing fabric
 - 3. Base course permeable aggregate
 - 4. Porous asphalt paving

1.02 STANDARD SPECIFICATIONS:

- A. CalTrans Section 39 HMA (Hot mix asphalt), open grade asphalt concrete.
- B. All work to be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction, latest edition and supplements
- C. American Standard Testing Materials, (ASTM)
- D. American Association of State Highway and Transportation Officials, (AASHTO).

1.03 RELATED WORK IN OTHER SECTIONS:

Section 02200 – Excavation and Backfill

1.04 SUBMITTALS:

- A. Submit to the Engineer for approval:
 - 1. Base course permeable aggregate sieve analysis.
 - 2. Base course permeable aggregate infiltration rate.
 - 3. Equipment and procedures to be utilized for the permeable aggregate installation.
 - 4. Porous asphalt aggregate sieve analysis.

5. Porous asphalt composition.
6. Previous experience of the proposed porous asphalt installer with porous asphalt placement.

PART 2 - PRODUCTS

2.01 STRUCTURAL SOIL-BEARING FABRIC:

A. FILTER FABRIC:

1. Material to be: Mirafi #140n non-woven or, approved equal.

2.02 BASE COURSE PERMEABLE AGGREGATE:

- A. The base course permeable aggregate shall be installed below the porous asphalt paving and the top course permeable aggregate as applicable.
- B. Aggregates to be open-graded, fractured, friction course. To ensure free drainage, material to be clean with minimal fines. The compacted top course permeable aggregate minimum infiltration rate of 40 inches per hour.
- C. Base course material to be a minimum of 75% fractured with at least one fractured face by mechanical means on each individual particle larger than 'A'. A sand and gravel source is acceptable for this material.

Gradation: Aggregate to meet the following particle size limitations.

Sieve Size	Percent Passing By
1/2"	100
3/8"	95-100
No. 4	30-50
No. 8	15-15
No. 200	2-5

Note: Aggregate should be uniformly graded between #8 and #200 sieve.

2.03 POROUS ASPHALT PAVING:

- A. This mix is intended to have an acceptable balance between adequate and uniform permeability and strength.
- B. The amount of liquid asphalt used in the formulation must be precisely controlled to obtain the desired strength while not adversely affecting the

permeability.

C. Aggregate:

1. Material to be clean, open graded, fractured.
2. Aggregate to be a minimum of 75% fractured with at least one fractured face by mechanical means of each individual particle larger than 1/4".
3. Gradation: Aggregate to meet the following particle size limitations:

Sieve Size	Percent Passing By
1/2"	100
3/8"	95-100
No. 4	30-50
No. 8	5-15
No. 200	2-5

Note: Aggregate should be uniformly graded between #8 and #200 sieve.

D. Asphalt Cement:

1. Asphalt Grade: AASHTO M-20
2. Viscosity Grade: AC-20 AASHTO M-226-731
3. Stripping Resistance. ASTM D1664
4. Asphalt Content: 5.75-6% of weight of dry aggregate; test using FHWA Report No. FHWA_RD-74-2

2.04 TESTING:

- A. The Owner will be performing testing of materials delivered to the job site for the purpose of verifying compliance with the contract documents. The Owner testing is for this purpose only and not for construction quality control by the Contractor.
- B. The Contractor shall coordinate directly with Owner testing relative to the delivery schedules of the imported materials. Sampling will be scheduled each day deliveries occur.
- C. The Contractor shall provide testing and surveillance as required to assure

materials and work fully comply with contractor requirements.

- D. The Contractor at a price equal to the Owner contract testing agreement shall pay for Owner tests that do not meet specifications. The Contractor shall pay directly to the testing organization upon invoice, which has been approved by the Owner.

PART 3 - EXECUTION

3.01 SUBGRADE ESTABLISHMENT:

- A. No work shall be performed in this section until sub-grade is 100% completed and accepted by the Soil Engineer.
- B. Sub-grade shall be prepared as required while limiting undue compaction; permeability must be maintained. Equipment with tracts or over-sized rubber tires shall be used; DO NOT use vehicle with standard rubber tiers.
- C. Sub-grade shall be established to within the tolerance of +0.00' or -0.10' of the design subgrade elevation.

3.02 STRUCTURAL SOIL-BEARING FABRIC INSTALLATION:

- A. No loose material is allowed on sub-grade prior to placement of structural fabric. Loose material is to be removed prior to placement.
- B. Fabric to be laid on smooth, compacted sub-grade surface between drainage trenches.
- C. Prior to placement of structural-bearing fabric requires approval of sub-grade conditions by the inspector.
- D. Structural fabric must be flat on stabilized sub-grade for full width.
- E. Dimensions to be a minimum width of 12.5' and minimum continuous length of 30 LF. or per manufacturer's recommendation.
- E. When the length of the fabric is not continuous, the lateral seam shall have a minimum overlap of 24".
- G. Fabric shall not be folded or turned up along the edges.
- H. The fabric shall be field cut as necessary to meet specified tolerances of

distance from drainage trenches.

- I. Fabric shall be placed between trenches. In no instance shall fabric cover trench, lie against aggregate or pea gravel, or extend vertically above sub-grade.
- J. Stabilization: Immediately upon laying, the fabric is to be covered with base aggregate. No loaded trucks are to be permitted to move over fabric-covered surfaces until a minimum of 4" of aggregate has been placed, except if specifically approved by the inspector, who will require strict, direct - 100% - control of all vehicle movement on site.

3.03 EQUIPMENT MOVEMENT

- A. No trucks or equipment will be allowed to drive over the top of the trenches except trackequipped machinery utilized in spreading base aggregate materials, or where a 12" depth base aggregate temporary roadway has been established. Backfill trenches are to be staked and "flagged" 3' above grade for identity.
- B. In the event non-track traffic is observed or evidenced to cross trenches, the Contractor shall, at their own expense, expose the drainpipe in the area directed for observation by the Engineer and repair any damage promptly.

3.04 AGGREGATE PLACEMENT

- A. Moisture Content: Aggregate to contain 3.5% to 4.0% moisture content to ensure that fines do not migrate and to facilitate proper compaction. The Contractor must ensure that aggregate leaving the source plant meets this requirement and is required to apply water to aggregate on site to attain and maintain this minimum moisture content in stockpile and during all placement operations.
- B. Prior to aggregate placement, remove any excess or contaminated backfill from the subsurface drainage trenches.
- C. Surface must be free of standing water and sub-grade stabilized with structural fabric in place prior to placement.
- D. Materials to be placed in layers not exceeding 6" bulk and 4 %" compacted in depth. Each layer must be spread uniformly with equipment that will not cause perceptible separation in gradation (segregation), preferably a self-propelled paving machine.

- E. Should there occur, during any stage of the spreading or stockpiling, a separation of the material particles, the Contractor must immediately remove and dispose of segregated material and correct or change handling procedures to prevent further separation.

3.05 AGGREGATE COMPACTION

- A. Each layer shall be compacted to a minimum density of not less than 95% of maximum dry
- B. Use Static Tandem Drum-type roller of not less than five tons weight.

3.06 AGGREGATE TOLERANCES

- A. The Contractor shall utilize a laser plane system for grade control.
- B. The surface of the base course permeable aggregate in areas to be paved with porous asphalt shall not deviate from designated compacted grade within the range of -0.50" and 0.00".
- C. Upon completion of fine grading, compaction, and Contractor confirmation of conformance with the tolerances, the Contractor shall notify the Engineer and schedule an inspection for approval. The Contractor shall have a laser plane system available to the Engineer for the inspections. The Contractor shall not be authorized to pave over the permeable aggregate until it has been inspected and approved by the Engineer.

3.07 POROUS ASPHALT CONCRETE PAVING INSTALLATION

- A. Pavement, where possible, shall be laid utilizing self-propelled paving machine of 10' minimum width and laser plane controlled.
- B. Plant mix temperature of asphalt shall be a minimum of 260 degrees F.
- D. The mix shall be transported to the job site in clean vehicles with smooth dump beds that have been sprayed with a non-petroleum release agent. Limit the time of haul to avoid segregation of the asphalt to the bottom of the truck bed. The mix should be covered during transport to prevent cooling and the formation of lumps.
- D. Asphalt shall be placed at a temperature between 240 degrees F. and 260 degrees F.
- E. Vertical joints between successive days' work shall be given a light tack coat

of emulsified asphalt SS-1, diluted with one part water to one part emulsified asphalt.

- F. Surface of the first lift shall be clean and dry before applying the second layer. No tack coat need be applied on the horizontal surface of the first lift.
- G. The surface elevation, in the compacted condition, shall not deviate more than 'A" from specified elevations. Trueness measurements to be taken from 10' long straight edge placed in all directions.
- H. Upon completion of the paving and Contractor confirmation of conformance with the approval tolerances, the Contractor shall notify the Engineer and schedule an inspection for approval. The Contractor shall have a laser plane system available to the Engineer for the inspections. The contractor shall not be authorized to place any surfacing over the pavement until the grade has been inspected and approved by the Engineer.
- I. The Contractor shall keep the porous asphalt free of contamination from site soil.. The Contractor shall take precautions as necessary such as washing truck tires, etc.

3.08 COMPACTION OF POROUS ASPHALT

- A. Compaction should take place when the surface is cool enough to resist a 9-Mg roller (class equivalent of a 10 ton roller) One or two passes is all that is required for proper compaction. Any more will reduce porosity.
- B. The first lift shall be rolled to a minimum of one rolling over entire area.
- C. The second lift (top leveling course) shall be rolled a minimum of two rollings.. The patterns of each successive rolling shall be at right angles or crossing diagonal alignment.
- D. Upper surface shall receive a final rolling utilizing a one-ton roller to remove all roller marks and imperfections in the surface.

END OF SECTION 02527 PERMEABLE AGGREGATE AND POROUS ASPHALT
PAVING

SECTION 02570
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Principal work in this Section includes but is not necessarily limited to:
 - 1. Painted markings, including ADA/Title 24 required markings and court striping.
- B. Related work in other Sections includes but is not necessarily limited to:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions of the Contract for Construction, Supplementary Conditions to AIA Document A201, and other Sections in Division 1 of these Specifications.
 - 2. All other painting and signage.

1.02 HANDLING

- A. Conform to the applicable requirements of Section 01640, and each product manufacturer's specific recommendations.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Paint: One of the following of the color(s) selected by Engineer and as required by requirements of governing agencies:
 - 1. Vinyl-Stripe vinyl epoxy paint W-801 by Dunn Edwards Corp.
 - 2. 520 Traffic Line Paint by Frazee Industries.
 - 3. 160 Vinyl Traffic Paint by Sinclair Paint Co.
 - 4. Or equal.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify conditions and measurements affecting the work of this Section at site. Make sure that all conditions detrimental to the proper and timely execution of this work have been corrected before proceeding.

3.02 PREPARATION

- A. Remove all dust, debris and other foreign substances detrimental to paint bond from asphalt paving. Use a commercial degreasing solution to remove grease and oil.
- B. Make all required field measurements and layouts for painted lines, legends and directional arrows.

3.03 PAINTING

- A. Mix and apply paint in accordance with the paint manufacturer's printed instructions.
- B. Paint pavement lines, space numbers, legends and directional arrows in the layout shown on the Drawings, using suitable mechanical equipment. Apply the paint in two coats at the paint manufacturer's recommended application rate. Cut off the painted markings sharply at ends so they are free of excess paint build-up; edges shall be straight and even, free of fuzziness, wavering, or holidays.
- C. Dry film thickness of cured paint film shall be 15 mils minimum, but in no case less than required for complete opacity.
- D. Erect temporary barricades and warning signs and leave them in place until the painted markings have thoroughly dried.

PART 4 MEASUREMENT AND PAYMENT (NOT USED)

END OF SECTION 02570 PAVEMENT MARKINGS

SECTION 02755

DECOMPOSED GRANITE PAVING

PART 1 GENERAL

1.01 SUMMARY

- A. Provide decomposed granite paving with incorporated soil stabilizer as called for on the Plans, specified herein, and needed for a complete and proper installation.

1.02 RELATED SECTIONS

- A. Related work:
 - 1. Section – Excavating and Backfilling

1.03 REFERENCES

- A. American Society of Testing and Materials (ASTM):
 - 1. C 136, Method for Sieve Analysis for Fine and Coarse Aggregate

1.04 QUALITY ASSURANCE

- A. Installation shall be by a Contractor and crew with at least one year of experience in placing decomposed granite with stabilizer on projects of similar nature or dollar cost.
- B. Paving: Contractor shall replace without additional cost to the Owner all areas of paving which may become defective within one (1) year after date of acceptance.
- C. Sterilization: Contractor shall maintain all areas of paving free of vegetation growing through from below for (45) days after date of acceptance. Any procedure required for eradication of such vegetation growth shall be done by the Contractor at no additional cost to the Owner.

1.05 SUBMITTALS

- A. Shop or product Plans, and product data.
- B. Products:
 - 1. (3) 1-lb. samples and sieve analysis for grading of decomposed

granite or crushed 3/8" minus aggregate. Color to "Adobe Sunset" by Southwest Boulder & Stone, (760) 342-5522, or approved equal.

2. (3) 1-lb. samples of soil stabilizer by Stabilizer Solutions. 205 South 28th Street, Phoenix, AZ 85034 (800) 336-2468, or approved equal.

C. Test results from an independent testing laboratory for compliance of gradation of decomposed granite material or 3/8" minus crushed aggregate in accordance with ASTM C 136 – Method for Sieve Analysis for Fine and Coarse.

1.06 MOCK-UPS

A. Install 4 ft. wide x 10 ft. long mock-up of decomposed granite or 3/8" minus crushed aggregate paving with Stabilizer additive at location as directed by Engineer.

B. This area shall be the standard from which the work will be judged and shall it be incorporated into the work.

1.07 EXCESS MATERIALS

A. Provide Engineer with the following excess materials for use in future decomposed granite or crushed 3/8" minus aggregate paving repair:

1. 40 – 50 lb. bags of the decomposed granite.

2. 1-40 lb. bag of the Stabilizer additive.

1.08 ENVIRONMENTAL CONDITIONS

A. Do not install decomposed granite or crushed 3/8" minus aggregate paving during heavy rain.

PART 2 PRODUCTS

2.01 STABILIZER BINDER

A. Patented, non-toxic, organic binder that is a colorless and odorless concentrated powder that binds decomposed granite or crushed 3/8" or 1/4" minus aggregate together to produce a firm surface.

B. Provided by: Stabilizer Solutions, (800) 336-2468, or approved equal.

2.02 DECOMPOSED GRANITE OR 3/8" MINUS CRUSHED AGGREGATE SCREENINGS

- A. Clean, non-plastic, free from deleterious or foreign matter, natural or manufactured from crushed rock. Do not use limestone screenings or stone dust that do not conform to the grading requirements shown below.
- B. Crushed Stone Sieve Analysis Percentage of Weight Passing:
Square Mesh Sieve AASHTOT11-82 and T27-82

Conform to the grading requirements shown below.

Sieve Designation	Percent Passing
3/8"	100
No. 4	95-100
No. 8 (2.36 mm)	75-80
No. 16 (1.18 mm)	55-65
No. 30 (0.600 mm)	40-50
No. 50 (0.300 mm)	25-35
No. 100 (0.150 mm)	20-25
No. 200 (0.075 mm)	5-15

- C. Acceptable local supplier: Southwest Boulder & Stone, (760) 342-5522, or approved equal.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

- A. Subgrade that is to receive decomposed granite shall be prepared immediately prior to placing of surfacing. After area to be paved is brought approximately to required grades, scarify to a minimum depth of 6 inches.
- B. After scarifying, loosened material shall be worked to a finely divided condition with rocks no larger than 1 inch and the moisture content brought to optimum by the addition of water, by the addition and blending of dry, suitable material or drying of existing material. Subgrade shall then be compacted to at least 95% standard Proctor density per ASTM D 698. Re-grade high and low areas to a uniform grade.
- C. No placement of decomposed granite surfacing material shall be allowed until approval of subgrade by the Owner.

3.02 INSTALLATION

- A. Blending stabilizer: Blend a minimum 14 lbs. of Stabilizer per ton of

decomposed granite or crushed 3/8" minus aggregate screenings. It is critical that Stabilizer be thoroughly and uniformly mixed throughout decomposed or crushed 3/8" minus aggregate screenings.

- B. Placement of Decomposed Granite Screenings or 3/8" Crushed Minus Aggregate Screenings: Upon thorough moisture penetration, compact aggregate screenings to 95% relative compaction by compaction equipment such as: double drum roller (2-4 ton) or single drum roller (1000 lbs.) vibratory plate tamp. Do not begin compaction for 6 hours after placement and up to 48 hours.
- C. Contractor shall take precaution in compacting decomposed granite or crushed 3/8" minus aggregate screenings when adjacent to planting and irrigation systems.
- D. Repairs and Protection: Remove and replace decomposed granite or crushed 3/8" minus aggregate paving that is damaged, defective or does not meet requirements of this section.
- E. The final surface elevations shall not deviate more than 3/8 in. under a 10 ft long straightedge. Rework to tolerance as required.
- F. The surface elevation of decomposed granite shall be flush with adjacent paving, drainage inlets, concrete collars or headers.

3.03 FIELD QUALITY CONTROL

- A. After removal of excess, check final elevations for conformance to the Plans.

END OF SECTION 02755 DECOMPOSED GRANITE PAVING

SECTION 02770

SITE FURNISHINGS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following site furnishings:

1. Benches.
2. Tables.
3. Barbeque.
4. Fitness Equipment.

1.02 REFERENCES

- A. Architectural Precast Association (APA).
- B. ASTM

1.03 SUBMITTALS

A. Product Data: Submit product data for manufactured materials and products.

B. Shop Drawing

1. Show in-place location, fabrication details, plans, elevations, anchorages, reinforcement, connection details and methods, dimensions, finishes, relationships to adjacent materials, and erection and placement.

C. Samples: Nominal size 6" sq. by appropriate thickness, of each type of unit and finished facing shown and specified for approval of quality, color, and texture of surface finish. Submit prior to fabrication.

D. Mix Design(s): Propose concrete mix design for each type and color of concrete mix.

E. Test Reports: Compressive Strength. Supply 12 test results from the last year showing the required results of 5000 PSI.

1.04 QUALITY ASSURANCE

- A. Fabricator's Qualifications: Firm shall have a minimum of ten (10) years experience in producing units similar to those required for this Project, with sufficient production capacity to produce and deliver required units without causing delay in Work.
 - 1. Fabricating plant shall be a certified plant and member of one of the following:
 - a) Architectural Precast Association (APA).
 - b) Precast/Prestressed Concrete Institute (PCI), Group A1.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver units to the Project site in such quantities and at such times to ensure continuity of installation.
- B. Deliver on a truck owned by the manufacturer. Truck to have a crane or a forklift for placement. Driver to be trained to use applicable equipment. Placement where possible. Owner to place product not reachable by manufacturer's equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Approved Fabricators:
 - 1. Quick Crete Products Corp. P.O. Box 639 Norco, CA 92860. (951)737-6240 (main office), (951) 737-7032 (fax) www.quickcrete.com Attn: Scott Ulrich, (760) 500-8609, sulrich@quickcrete.com.
 - 2. Fabricators not listed as approved shall request approval. Approval request must be sent to the owner 30 days before bid opening. Request must include drawings, color samples, and an actual product for review by owner. **Approved Fabricator must be able to produce all units within an 8-10 week lead-time. Approved Fabricator must ship on company owned trucks equipped with a crane or forklift for off-loading product.**

2.02 MATERIALS

- A. Concrete Materials:
 - 1. Portland Cement: ASTM C 150, Type III (gray), to achieve desired finish colors. Use only one brand, type, and color from the same mill.
 - 2. Aggregates: ASTM C 33, gradation may differ to achieve desired finish characteristics. Select coarse and fine aggregate colors and screen sizes to match approved sample(s). Verify that adequate supply, from one pit or quarry, for each type of aggregate is available for the entire Project. If possible

obtain entire aggregate supply prior to starting Work, or have aggregate supply held in reserve by aggregate supplier.

3. Water: Potable. Clean, clear, and free from deleterious amounts of salts, acids, alkali's, organic materials, oils, detergents, or other matter that may interfere with color, curing, or strength of concrete.
 4. Admixtures: Select to be compatible in specified mix.
 - a) Air Entraining: ASTM C 260.
 - b) Water Reducing: ASTM C 494, Type A,B,C,F. or G.
 - c) Coloring Agent: ASTM C 979, compatible with other concrete materials.
- B. Formwork:
1. Provide forms with acceptable form facing materials that are non-reactive with concrete or form release agents and will produce required finish surfaces.
 2. Construct and maintain forms to produce precast concrete units of shapes, lines, and dimensions indicated, within specified tolerances.
- C. Reinforcing Materials:
1. Reinforcing Bars: ASTM A 615, Grade 40
- D. Connection Materials:
1. Bolts, washers, nuts to be zinc plated.

2.03 MIXES

- A. Design mixes for each type of concrete specified may be prepared by an independent testing agency or by architectural precast manufacturing plant personnel at precast fabricator's option.
- B. Proportion mixes by either testing agency trial batch or field test data methods in accordance with ACI 211.1, using materials to be used on the project, to provide normal weight concrete with properties as follows:
1. Compressive Strength: 5,000 psi when tested in accordance with ASTM C 39.
 2. Maximum water cement ratio 0.47 at point of placement.
 3. Add air-entrainment admixture to result in air content at point of placement complying with ACI 533 requirements.

2.04 FABRICATION

- A. General:
1. Fabricate precast concrete units with manufacturing and testing procedures, quality control recommendations, and dimensional tolerances as specified in ACI 533, unless more stringent requirements are shown or specified.

2. Fabricate units straight, smooth and true to size and shape, with exposed edges and corners precise and square, unless otherwise indicated.
3. Benches must be made without any visible lift points.

- B. Reinforcement: Comply with CRSI "Manual of Standard Practice" and ACI 318 recommendations. Reinforce architectural precast concrete units to resist handling, transportation stresses, and to comply with specified performance criteria.
- C. Comply with ACI-533 requirements for measuring, mixing, transporting, and placing concrete.
- D. Consolidate concrete using equipment and procedures complying with ACI 533.
- E. Discard units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are approved by the Owner and meet specified requirements.
- F. Fabrication Tolerances: Fabricate to tolerances listed in ACI-533.

2.05 FINISHES

- A. Owner to chose a concrete color from one of Quick Crete Products Corp. standard colors. Texture to determined from Quick Crete Products Corp. standard textures. Sealer to be Quick Crete's Standard Gloss Sealer.
 1. Surface finish free from pockets, sand streaks, honeycomb, with uniform color and texture. Bug holes larger than 1/4 inch in diameter are not acceptable and must be filled.
- B. Seam lines to be stoned neatly to minimize appearance. Products with wide or uneven seam lines could be subject to rejection.

2.06 SEALERS

- A. All surfaces to be sealed with three coats of a water based acrylic sealer, which has graffiti-resistant qualities. Must be non-sacrificial so most graffiti can be cleaned with lacquer thinner and not require resealing.

2.07 SOURCE QUALITY CONTROL

- A. Inspect and test architectural precast concrete in accordance with ACI 533.
- B. Defective Work: Discard units that do not conform to requirements as shown or specified. Replace with units which meet requirements.

2.08 GUARANTEE

- A. Fabricator to provide a one-year guarantee against manufacture's defect

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions 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.

3.02 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions.
- A. Bench requires epoxy applied to cover bottom of entire leg.

3.03 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 02770 SITE FURNISHINGS

SECTION 02780

VEHICULAR ENTRANCE GATE

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide metal gates where shown on the Plans, as specified herein, and as needed for a complete and proper installation.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Cast-In-Place Concrete for footings.

1.02 SUBMITTALS

- A. Product data for each type of gate specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;

1.03 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

PART 2 - PRODUCTS

2.01 DIMENSIONAL DATA

- A. General:

1. Pipe sizes indicated are commercial pipe sizes.
2. Tube sizes indicated are nominal outside dimensions.
3. Roll-formed section sizes indicated are the nominal outside dimensions.

2.02 GALVANIZING

- A. On steel framework and appurtenances, provide galvanized finish with not less than the following weight of zinc per sq ft.
 1. Pipe: 1.8 oz, complying with ASTM A120.
 2. Hardware and accessories: Comply with Table I of ASTM A153.

2.03 GATES

- A. General:
 1. Fabricate gate frames of tubular members as indicated on the drawings.
 2. Provide additional horizontal and vertical members to assure proper operation of the gate, and for attachment of hardware, and accessories.
- B. Fabrication:
 1. Assemble gate frames by welding with rigid connections.
 4. Attach hardware by means which will provide security against removal and breakage.
- C. Gate hardware: Provide following for each gate:
 1. Hinges:
 - a. As indicated on the drawings.
 2. Latches:
 - a. As indicated on the drawings.
 - b. Provide padlock as integral part of latch.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Excavating:

- 1. Drill holes for post footings in firm, undisturbed or compacted soil, strictly adhering to the dimensions and spacing shown.
- 2. Post hole dimensions:
 - a. Provide foundations as indicated on the drawings.

- B. Setting posts:

- 1. Remove loose and foreign materials from sides and bottoms of holes, and moisten soil prior to placing concrete.
- 2. Center and align posts in holes.
- 3. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation.
- 4. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
- 5. Trowel tops of footings, and slope or dome to direct water away from posts.
- 6. Set keeps, stops, sleeves, and other accessories into concrete as required.
- 7. Keep exposed concrete surfaces moist for at least seven days after placement, or cure with membrane curing material or other curing method approved by the Engineer.

- C. Concrete strength:

- 1. Allow concrete to attain at least 75% of its minimum 28-day strength before gate is installed.

2. Do not, in any case, install such items in less than seven days after placement of concrete.
3. Do not hang gates until concrete has attained its full design strength.

D. Installing gates:

1. Install gates plumb, level, and secure for full opening without interference.
2. Lubricate and adjust the hardware for smooth operation.

END OF SECTION 02780 VEHICULAR ENTRANCE GATE

SECTION 02810

LANDSCAPE IRRIGATION

PART 1 GENERAL

1.01 DESCRIPTION

- A. Landscape irrigation system.
- B. Related work specified elsewhere.
 - 1. Section 02900 - Landscaping.

1.02 REFERENCE SPECIFICATIONS AND STANDARDS

- A. Standard Specifications for Public Works Construction.
- B. County of Riverside Plumbing Ordinance.

1.03 RESTRICTIONS TO THE WORK

- A. Portions of the site include existing public road:

The Contractor shall, therefore, conduct his work with a minimum of disturbance or interference to the traffic or cause disruption of existing electrical service, water service or other utilities.

1.04 SUBMITTALS

- A. Irrigation Material Submittal List and Descriptive Literature.

Within 14 days after award of contract, submit for acceptance, six (6) copies of completed forms:

Include manufacturer's name and model numbers for all materials required under this contract, together with two (2) copies of descriptive literature for each of the items listed on the Irrigation Material Submittal List. Contractor shall commence no work prior to receiving statement of acceptance of irrigation material submittal list and descriptive literature from Agency. Submit items as follows:

Wire and connectors
Brass pipe and fitting
Plastic pipe and fitting

Plastic pipe primer and solvent cement
Tracer/warning tape
Valve boxes
Automatic remote control valve
Gate valve
Valve operating wrench
Irrigation head
Quick coupling valve
Plastic valve identification tag
Automatic Irrigation Controller

B. Record drawings.

1. The Contractor shall provide and keep up to date a complete 'As-Built' record set of blue line prints which shall be corrected daily and show every change from the original Plans and Specifications and the exact 'As-Built' locations, sizes and kinds of equipment.
2. Before the date of the final inspection, the Contractor shall transfer all information, drafted by Contractor, from the "As-Built" prints to a sepia mylar. All work shall be neat, in ink and shall be approved by the Owner.
3. The Contractor shall dimension from two (2) permanent points of reference, building corners, sidewalk, or road intersections, etc., the location of all buried pipes and valves, any and all pilot wires to valves and controllers and all electric service lines to controllers. Dimensions shall be taken prior to backfilling of trenches.

C. Controller charts.

1. Provide three (3) controller charts for each controller supplied, showing the area covered by the automatic controller. Chart size to be the maximum size the controller door will allow, if possible.
2. The Chart is to be a reduced drawing of the actual as-built 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.
3. Chart shall be a blackline print with a different color used to show area of coverage for each station.
4. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils. thick.

5. These charts must be completed and approved prior to final inspection of the irrigation system.

D. Operation and Maintenance Manuals.

1. Prepare and deliver to the Owner, prior to completion of construction, all required and necessary descriptive material in complete detail and sufficient quantity, properly prepared in two individually bound copies of the operation and maintenance manual (loose leaf binders are acceptable). The manual shall describe the material installed and shall be in sufficient detail to permit operation personnel to understand, operate and maintain all equipment. Spare parts lists and related manufacturer information shall be included for each equipment item installed. Each complete, bound manual shall include the following information:
 - a. Index sheet stating Contractor's address and telephone number.
 - b. Duration of guarantee period.
 - c. List of equipment with names and addresses of local manufacturer representatives.
 - d. Complete operating and maintenance instructions on all major equipment.

PART 2 PRODUCTS

2.01 MATERIALS

Use new materials of the best grade, unless otherwise noted on plans, for each respective item, and of the same manufacturer for all items of one (1) type.

A. Pipe.

1. Plastic pipe and fittings.
 - a. Upstream of remote control valves (main lines): Use Schedule 80 PVC for all sizes of pipe and fittings (mainlines).
Downstream of remote control valves (lateral lines): Use Schedule 40 PVC pipe for all sizes and fittings.
 - b. Extrude from 100% virgin normal impact unplasticized polyvinyl chloride (PVC) Type I, Grade I resin. Threaded

nipples to be PVC Type II.

- c. Pipe homogeneous throughout, free from visible cracks, holes or foreign materials. The pipe shall be free from blisters, dents, wrinkles or ripples, die and heat marks.
- d. Supplier shall be responsible to certify that manufactured pipe meets the stated levels of quality. Continuously and permanently mark pipe with manufacturer's name or trademark, kind and size (IPS) of pipe, material, manufacturer's lot number, schedule or type, ASTM qualifying designation, and NSF seal of approval.
- e. Testing of pipe. The contractor shall show written certification by supplier that polyvinyl chloride pipe has successfully passed the following tests:
 - (1) Acetone test. Immerse a sample of pipe in 99% pure anhydrous acetone for 15 minutes; at the end of this time there should be no evidence of flaking or delamination on the inner or outer walls of the pipe. Evidence of softening and swelling shall not constitute failure.
 - (2) Flattening. Cut a test specimen two inches long from each end of the pipe sample. Flatten each test specimen between parallel plates of a press until the distance between the plates, in inches, is equal to sixty (60) percent of the pipe o.d., and there shall be no evidence of cracking, splitting or breaking.
- f. Plastic pipe fittings and connections.
 - (1) Rigid polyvinyl chloride (PVC) virgin Type I, Schedule 40 with working pressure no lower than that of pipe. Sockets to be tapered conforming to the outside diameter of the pipe, as recommended by ASTM standards. All fittings are to withstand the 15 minute acetone test, as for pipe, and shall be approved.
 - (2) Molded fittings shall be marked with manufacturer's name or trademark, type PVC, size, ASTM qualifying designation and NSF seal of approval. Extruded couplings to be produced from NSF rated raw materials and meet ASTM Standards. Supplier shall be responsible to certify that extruded fittings and

connections meet the stated levels of quality.

- g. Plastic pipe primer and solvent cement will be "Weld-On 7-11". No clear primer may be used.
- B. "Detectable" type tracer/warning tape to be 'Blue', 2" wide minimum, with the words "Buried Water Line Below" - Refer to main line installation.
- C. Concrete.
- 1. Use Portland cement, conforming to ASTM C-150, Type II, unless otherwise specified.
 - 2. Sand fine granular material resulting from the natural disintegrating of rock and free from injurious amounts of oil, mica, clay and other deleterious substances. Sand, when tested in accordance with ASTM Standard Method of Test C-117, shall not exceed 3% by weight of clay or silt.
 - 3. Rock and gravel. Mechanically wash all rock for use in concrete consisting of gravel or a combination of gravel and sound crushed rock, having clean, hard, tough durable and uncoated pieces, free from injurious amount of soft, friable, thin elongated or laminated pieces, alkali, oil, organic or other deleterious substances.
- D. Gate valves and valve boxes (Including valves for PVB).
- 1. Gate valves shall be the same size as the pipe lines in which they are installed and shall open "left." All valves shall be packed with an approved brand of graphited braid stem packing.
 - 2. Refer to the Plans for manufacturer's name and model number.
 - 3. For sizes 2" and smaller.
 - a. 150 pound saturated steam rated.
 - b. Brass body. ASTM B-62.
 - c. Screwed joints.
 - d. Non-rising stem.
 - e. Screwed bonnet.
 - f. Solid disc.
 - g. Equipped with handwheel.
 - 4. For sizes 2-1/2" and larger.
 - a. 200 pound O.W.G.
 - b. Iron body. ASTM A-126, Class B.
 - c. Flanged joints.

- d. Non-rising stem.
- e. Bolted bonnet.
- f. Double disc.
- g. Equipped with operating nut.
- h. All valves to be Mueller No. A-2360 square head

E. Quick-coupling valves, couplers and hose swivels.

- 1. Valves shall be of brass or bronze construction with built in flow control and self-closing.
- 2. Valves shall have.
 - a. Locking thermoplastic lid.
- 3. Couplers shall be brass or bronze construction.

F. Automatic control system.

- 1. Automatic controller. Refer to plan for approved manufacturer's name, model number and size.
- 2. Stainless steel enclosure. Refer to plan for approved manufacturer's name, model number and size.
- 3. Automatic irrigation control wire.
 - a. Electric operated.
 - (1) Twenty-four volt wire to solenoid valves to be direct burial conductor type UF #14 AWG copper, 3/64" thickness, PVC coating, U.L. approved for runs up to 1500 feet and type UF #12 AWG copper, 3/64" thickness, PVC coating, U.L. approved for runs up to 2400 feet.
 - (2) Common wires to be white coded and pilot wires to be color coded; using a minimum of eight (8) different colors. See wire coding chart on plans for specified colors.
 - (3) Electrical splices shall be waterproof and shall be located in valve box.
 - (4) An expansion curl shall be provided so that in case of repairs the valve may be brought to the surface to be serviced without disconnecting the control wire

4. Automatic control valves.
 - a. Refer to plan for approved manufacturer's name, model number and size.
 - b. Valves shall be normally closed.
 - c. All valves shall be diaphragm actuated, equipped with flow control adjustment and relief pet cocks, so valve may be manually operated. One piece diaphragms only; no "O" rings allowed.
 - d. All valves shall be of the same manufacturer.
 - e. Valves shall be completely serviceable from the top without removing the valve body from the mainline system.

G. Valve Boxes.

1. Valve boxes shall be structural foam molded with polyofin plastic with bolt-down locking devices, for each gate valve, flow meter assembly, quick coupling valve, remote control valve, and wire splices. Valve boxes shall comply with ASTM-D-635 or UL-94 and be as manufactured by Carson-Brooks Plastics, LTD. or Applied Engineering Products, or approved equal.
2. Valve boxes for any valves located within paved surfaces shall be concrete valve box with cast iron cover. Boxes in paving shall be Carson PB 1320 Jumbo Boxes.
3. Box Sizes:
 - a. For gate valves and wire splices. 10" round (x10 1/4 deep).
 - b. For remote control valves, quick coupling valves. 11 3/4" wide x 17" long rectangular (x 12" deep).
4. Valve Box Cover Identification.

Valve box covers shall be head branded with 2-inch tall metal branding letters. Arrange from the same viewing position (no upside down box covers in box groups). Contractor shall not be allowed to use a hot knife for branding purposes.

 - a. Gate valve box cover shall be marked "G.V."

b. Remote control valve box cover shall be marked "R.C.V." and its corresponding controller station number.

c. Quick coupling valve box cover shall be marked "Q.C."

H. Irrigation heads.

1. Refer to the Plans for manufacturer's name and model number required.

2. Irrigation heads must be a current production model, in production for at least one year.

3. Spray heads.

a. Spray head: Pop-up irrigation heads to be 6" or 12" plastic with screw adjustable nozzle. Heads to be equipped with nozzle patterns shown on the Plans.

b. Rotary: Rotary heads to be gear-driven of the model indicated on the Plans.

I. Check valves and/or anti-drain valves.

1. Check valves vertical type same size as riser with stainless steel spring (5 to 6 pounds) loaded bronze type poppet valve lined with a flat neoprene disc. Valves seat shall be tapered to seat against disc.

2. Horizontal check valves shall be constructed of bronze with closing disc plate set on angle, disc holder shall contain renewable composition disc, these discs shall close tight to prevent drain back.

J. Valve Identification Tags.

Identification tags for electrical remote control valves shall be manufactured from polyurethane Behr Desopan. Use Christy's standard tag hot stamped with black letters on yellow background. The tags shall be numbered to match programming (Controller Station No.) as indicated on the Plans. Provide one (1) tag for each electric remote control valve.

K. Materials to be furnished.

The following items shall be "turned-in" to the Owner prior to final inspection and acceptance of the irrigation system:

1. Three (3) sets of operation and maintenance manuals.
2. Two (2) controller charts for each controller installed.
3. Two (2) 5'-0 valve wrenches where 2-1/2" size and larger gate valves are installed.
4. 10% additional of each type check and anti-drain valves installed.
5. Two (2) couplers to match quick coupling valves installed.
6. Two (2) hose swivels to match quick coupling valves installed.
7. Two (2) keys for opening each type lock lid valve box installed
8. Two (2) keys for each controller installed.
9. Two (2) keys to operate lock lid quick coupling valves.
10. Two (2) sets of wrenches for servicing and adjusting each type irrigation head installed.
11. 10% additional of each "Type" irrigation head installed. (See Plan).

PART 3 EXECUTION

3.01 INSTALLATION

A. General.

1. Plans and specifications. Plans are diagrammatic. Furnish and install all work called for on the Plans, whether or not specifically mentioned in the specifications.
2. Perform minor adjustment in location or alignment of new work, to avoid existing utilities, as directed without additional cost.
3. Contractor to measure and locate all irrigation heads, by a lime marker or stake, before installing irrigation riser. Marker locations are to be inspected and approved by the Owner prior to installation of any irrigation risers.
4. Existing Trees.
 - a. Exercise all possible care and precaution to avoid injury to tree roots, trunk(s), and branches. All excavation within drip line of trees shall be done very carefully. Use hand pick and shovel if it appear that large roots are within trenching zones.
 - b. Alter alignment of pipe to avoid large tree roots, 2" and larger in diameter.
 - c. Wrap exposed and bridging tree roots with several layers of burlap and keep moist. Close all trenches within drip lines within 24 hours.

- d. All severed roots, 1" and larger, shall be hand pruned with sharp tools and painted with approved horticultural seal.

B. Trenching.

1. Excavate trenches for pipe and conduit. Schedule work so excavations shall be open and exposed for a minimum period of time.
2. After piping and conduit are laid in place, tested and approved, backfill as soon as possible with excavated material or approved imported soil. Unless otherwise specified in the Standard Specification Section 308-2 or noted on the Plans, all backfill shall be placed in layers and compacted by mechanical means to a density of not less than 90% of the maximum density or to a density at least equal to that of the adjacent soil, whichever may be greater.

C. Connection to existing mainline.

1. Connect to existing mainline where shown on plans.
2. Connect to existing PVC pipe by any of the following methods.
 - a. PVC fitting for solvent weld on PVC pipe only.

D. Pipe.

1. Pipe sizes shall be as shown on plan. Pipe size from main line to control valves to be as noted on plan or shall be the same size as the largest line downstream of the control valve.
2. When two (2) pipes are placed in the same trench provide a minimum of 6" space between pipes - parallel lines shall not be installed directly over one another.
 - a. Plastic pipe.
 - (1) Main lines (upstream of RCV). Install 24" below grade, as measured from top of pipe.
 - (2) Lateral lines (downstream of RCV). Install 12" below grade, as measured from top of pipe.
 - (3) Depth of irrigation pipes/sleeves and electrical conduits shall be as specified in the "Green Book" (Standard Specifications for Public Works Construction).

- (4) The bottom of the trench shall be free of rocks, clods and other sharp-edged objects. If rocks over 1" size are encountered at the bottom of the trench or within backfill @ 4" above pipe, Contractor shall have the option of removing rocks or placing 4" of sand below and above PVC pipe.
- (5) Place No. 12 gauge copper identification wire, new or used, at bottom of trench for all mainline PVC pipe. This is to provide a continuous electrical conductor between gate valves. Wrap each end around the valve body and bring up inside the valve box to the ground surface and loop back with 2'-0 of wire free. Before backfill of the last 10" of trench, place "Detectable" tracer/warning tape in trench to show location of buried mainline PVC pipe. The tracer/warning tape shall be electronically detectable, and the copper identification wire will still be installed. Scrape ends clean and wire to valves as above, providing 2'-0 loop.
- (6) Plastic pipe assembling.
Use care in handling, loading, unloading and storing to avoid damage. Store the pipe and fittings under cover before using and transport in a vehicle with a bed long enough to allow the length of pipe to lay flat, so as not to be subjected to undue bending or concentrated external load at any point. Any pipe that has been dented or damaged will not be accepted. Joining pipe by solvent weld. Use a non-synthetic bristle brush to spread filler cement applied from cans no larger than pint size. Clean and refill container each day. Primer and solvent cement used shall be as recommended by pipe manufacturer.
 - (a) Cut pipe square. All burrs shall be removed inside of pipe end. Chamfer outside end of pipe 10 degrees to 15 degrees.
 - (b) Clean and dry pipe and fitting socket.
 - (c) Check dry fit of pipe and fitting. Pipe should enter fitting socket about 1/3 to 3/4 depth.
 - (d) First, dissolve inside socket surface by brushing with primer. Use a scrubbing motion to assure penetration.
 - (e) Next dissolve surface of male end of pipe to be inserted into socket to depth of fitting socket by brushing liberal coat of primer. Be sure entire surface is well dissolved.

- (f) Again brush inside socket surface with primer. Then, without delay apply solvent cement liberally to male end of pipe.
 - (g) Also apply solvent cement lightly to inside of socket, using straight outward strokes to keep excess filler solvent out of socket. Time is important at this stage. Apply a second coat of cement to the pipe end. The solvent cement should be applied deliberately but without delay.
 - (h) While both the inside socket surface and the outside surface of the male end of the pipe are soft and wet with solvent cement, forcefully bottom the male end of the pipe in the socket, giving the male end a 1/4 turn if possible. The pipe must go to the bottom of the socket. Hold the joint together until both soft surfaces are firmly gripped for at least 30 seconds.
 - (i) After assembly, wipe excess cement from the pipe at the end of the fitting socket. A properly made joint will normally show a bead around its entire perimeter. Any gaps at this point may indicate a defective assembly job due to insufficient cement, or use of light bodied cement on large diameter where heavy bodied cement should have been used.
 - (j) Do not disturb joint for 30 minutes until initial setup of the cement occurs.
 - (k) Provide a firm, uniform bearing for the entire length of each pipe line, to prevent uneven settlement.
 - (l) Snake pipe from side to side of trench bottom to allow for expansion and contraction. One (1) additional foot per 100'-0 of pipe is the minimum allowance for snaking. Never lay PVC pipe when there is water in trench or when temperature is 32 degrees F. or below.
 - (m) Center load pipe with small amount of backfill to prevent arching and whipping under pressure. Leave joints exposed, for inspection during pressure test. No water will be permitted in the pipe until the above has been accomplished and a period of at least 24 hours has elapsed for solvent weld setting and curing.
- (7) Plastic pipe fittings and connections.
- (a) Use Schedule 40 female adaptor with Schedule

pipe to threaded joints.

- (b) Use 45 degree fittings at all changes in depth of pipe. Couplings to be of same material and wall thickness as pipe used.
- (c) Use teflon tape on all threaded joints. Screw hand tight and 1/2 turn by wrench. On PVC to steel connections, work the steel connections first.
- (d) Minimum length of PVC nipple shall be 4".

E. Gate valves and valve boxes.

- 1. Install shutoff valves as indicated on plans.
- 2. Utilize two (2) reinforcing rods, 3/8" size, in concrete thrust block under all gate valves. Refer to detail of concrete-thrust blocks.
- 3. Install gate valve in the valve box per plans/detail. Center valve box over the valve operating nut.

F. Quick-coupling valves, couplers, hose swivels.

- 1. Install 3/4" quick-coupling valves as detailed and where shown on plans.
- 2. Within 10'-0 of where a quick-coupling valve is installed, contractor shall paint a 3" diameter "yellow-spot" as approved on paving, curb or mow strip.

G. Automatic control system.

- 1. Install new automatic irrigation controller if and where shown on plans.
- 2. Automatic irrigation control wire.
 - a. Electric operated.
 - (1) Twenty-four volt wires. No field splicing of wire between controller and valve with continuous run between controller and valve. Factory splices are permitted in wire roll. Splicing of wire at the valve to be as follows:
Ends of wire (control and common) shall be bright copper twisted together to a minimum of three (3) turns and soldered immediately. Use Northstar Industries

Suresplice SK-14-12G (orange) or equal in accordance with manufacturers recommendations. No more than one splice per applicator. Water resistant wire connectors rated at 60c, 600v, with precision molded PVC socket and sealing plug may be used - eliminating solder and resin.

- (2) Common wires to be white coated and pilot wires to be color coated using a min. of eight (8) different colors. All 24-volt conductor wire to have minimum of 18" cover. Serpentine lay wire in trench below top of pipe to allow for expansion. Pull extra wire for splice in valve box so splice can be brought up and out of valve box for visual check. Lay wire in irrigation trenches adjacent to main and laterals from controller to remote control valve. When conductors from more than one (1) controller are in a common trench, the conductors from the individual controllers shall be bundled separately. Bundle wires and tape together with one wrap of tape. Provide 4" layer of sand below and 4" layer of sand on top of all control wires when clean fill, free from rocks 1" size and larger, is not available on site.

3. Automatic control valves.

- a. Valves shall be installed a minimum of 6" and a maximum of 10" from top of valve to bottom side of valve box.
- b. Provide a valve box for each automatic control valve.

H. Valve box

1. Use brick to firm base around box.
2. Provide 6" layer of $\frac{3}{4}$ " crushed gravel under automatic control valves.
3. Install valve box per detail.
4. Locate valve boxes near paved walk/surfaces where possible. Edge of valve boxes shall be set square and 12" from edge of pavement, walk or concrete curb.

I. Backflow Prevention Device

1. Type designed to operate on a reduced pressure principle vacuum breaker furnished with full port shut off valves and field-test cocks. Provide VIT SBBC-45SS enclosure to house backflow device.

2. Wye strainers at back flow device shall be 125 pounds class customer brass with 40 mesh Monel screen.

J. Flow Sensor

1. Shall be designed for installation with 18 AWG stranded copper wire with U.L style 1056 direct burial insulation.
2. For below grade installations the furnishing of PVC body valves installed in a marked control box is permitted.
3. For above grade installations provide brass body valves.
4. Flow sensors shall be capable of detecting main line breaks, unscheduled flows, and upper limit flows.
5. The flow sensor shall monitor and display station flow in GPM.
6. The flow sensor shall be furnished with a programmable flow check delay (1-6 minutes).
7. The flow sensor shall be furnished with an automatic flow LEARN mode for setting individual station limits, or manual entry, or semiautomatic monitor/set mode
8. The flow sensor shall be furnished with global percentage adjust to automatically factor upper flow limits for stations.
9. Automatic station advancement for station overflow.
10. Audio and visual alert for all flow violations.
11. Intelligent upper-limit processing for concurrent station operation.
12. Automatic closure of normally open master valve on main line break or unscheduled overflow.
13. Data Industries IR Series, or equal.

K. Flow Sensor Cable

1. Cabling required for connections from controller to flow sensor shall be installed in conduit:
2. Shielded 2-wire E.V Cable, or equal.

L. Irrigation heads

1. Use one manufacturer for each type of head.
2. Distance between irrigation head and edge of adjacent paving shall be equal to the diameter of the head installed or as indicated on plan.
3. Adjust all spray nozzles so that each lateral system will be as evenly balanced as possible.
4. Utilize triple swing joint for all risers to irrigation heads. Use threaded Schedule 80 PVC nipples with PVC fittings or as detailed on plan. Assemble in field only.
5. Do not exceed the maximum spacing shown on plans.
6. Install each tree bubbler inside as shown on detail.

M. Cleaning of irrigation piping.

1. Mains (water lines upstream of control valves).
Underground mains and lead-in connections to irrigation system are to be flushed by utilizing flush out assembly or quick coupler valve at the lowest elevation shown on plan.
2. Laterals (lines downstream of control valves).
 - a. Risers to be in place and trench backfilled leaving joints exposed prior to flushing.
 - b. Flush only one (1) lateral at a time starting nearest the water source progressing toward the end of the supply main.
 - c. Flush each lateral for sufficient time to insure thorough cleaning.

N. Test of piping. Test the entire main line piping system after installation of all valves for 4 hours, or test mains between isolation valves for a 2-hour period, under hydrostatic pressure of 125 pounds per square inch and prove tight; apply pressure by a force pump after all air has been expelled from the pipe. Lateral lines of the system shall be tested at line pressure with risers capped after expelling air from piping, each lateral shall be tested for at least 15 minutes; install pressure gauge at one riser per lateral during test. Maintain pressure in piping for time indicated. If leaks develop, replace the joints, or pipe, and repeat test. Perform all tests in presence of the Owner.

- O. Backfilling. After piping has been completed, tested and proven tight, backfill the trenches. Backfill shall be firmly settled by water.
- P. Testing and disinfecting water mains. (Disinfect lines only if used for domestic purposes.)
1. During the period of the test all the pipe joints shall be inspected for leakage; pipes showing leakage shall be replaced. Clean and re-caulk imperfect joints. Upon completion of repairs, the section shall be again subject to the test for two hours. During the test, the leakage shall not exceed that as recommended by manufacturer.
 2. All hydrostatic tests shall only be made in the presence of the Engineer and no pipes shall be backfilled until they have been inspected, tested and approved.
- Q. Inspection.
1. Inspections to be performed in the presence of the Owner.
 - a. Marker locations for placement of all irrigation heads prior to installation.
 - b. Inspections during installation.
 - c. Leakage test before backfilling.
 2. Inspections to be performed in the presence of the Owner.
 - a. Coverage test: At completion of irrigation installation, and prior to the start of any landscaping. Necessary adjustments and additional work will be completed prior to the start of landscape work. Controller shall be operational and ready for automatic cycling.
 - (1) Contractor shall not schedule inspection until the entire irrigation system has been flushed clean and all heads and other irrigation equipment have been adjusted for proper operation.
 - b. Final Inspection: Adjustment and cleaning of all heads at end of landscape maintenance period (see Section – Landscape).
 - c. Before acceptance of irrigation system, controller must operate on automatic operation. System must operate on complete automatic cycles for the last 15 days of the

maintenance period. The controller shall have a certificate from the irrigation supplier of proper installation.

- R. Completion cleaning. Upon completion of the work, remove excess material, rubbish, debris, etc., and construction and installation equipment from the site.
- S. Emergency repairs. The Owner reserves the right to make temporary repairs as necessary to keep equipment in operating condition without voiding the Contractor's guarantee bond nor relieving the Contractor of his responsibilities during the bonding period.
- T. Contractor to turn over to Owner all irrigation materials and equipment as noted herein, and plans prior to final acceptance.

PART 4 MEASUREMENT AND PAYMENT (NOT USED)

END OF SECTION 02810 LANDSCAPE IRRIGATION

SECTION 02900

LANDSCAPING

PART 1 GENERAL

1.01 DESCRIPTION

- A. Landscaping.
- B. Related work specified elsewhere.
 - 1. Section 02810 - Landscape Irrigation.

1.02 REFERENCE SPECIFICATIONS AND STANDARDS

- A. Standard Specifications for Public Works Construction.

1.03 SUBMITTALS

- A. Approvals.
 - 1. Provide written evidence that landscape irrigation system has been inspected and approved prior to start of any work of this section.
 - 2. Agronomic Soil Report of Existing Soils
 - a. Furnish a complete soils fertility soil analysis from a competent soil testing laboratory per 2.01 E.1 of this section.
 - 3. Agronomic Soil Report of Proposed Topsoil
 - a. Furnish a physical and chemical soil analysis from a competent soil testing laboratory per 2.01 E.1 of this section. Import topsoil shall be in accordance with the requirements of the SSPWC, Class A topsoil.
- B. Certificates. Prior to installation, written certifications shall be submitted to the Agency for the following:
 - 1. Mulch
 - 2. Herbicides
 - 3. Soil Conditioners
 - 4. Tree supports
 - 5. Seed

6. Fertilizers
7. Mycorrhizal Products

PART 2 PRODUCTS

2.01 MATERIALS

A. Tree supports.

1. Stakes for trees. Lodge Pole pine, made from the entire bole of the tree with bark removed. Completely treat in a solution of copper naphthanate.
 - a. 2" or 2-1/2" diameter.
 - b. 8'-0 length minimum for 5 gallon trees; and 10'-0 length minimum for 15 gallon and 24" box trees.
 - c. Stakes shall be conically pointed at one end, with 10" long taper point and chamfered at the other end. Tree stakes to be cut below the first lowest branch.
 - d. Tree ties: Refer to planting details.

B. Plant material.

1. Trees and shrubs

- a. Refer to landscape planting plan for plant list and quantities. Plant list quantities should be used only as a guide. Actual quantities to be installed shall be layout shown on Plans.
- b. Size as per planting plan plant list. Condition – American Nursery Standards.
- c. Quality.
 - (1) Healthy, shapely, well rooted, disease and insect free, not deformed or root bound.
 - (2) Grown in nurseries inspected by State Department of Agriculture.
 - (3) Free of abrasions, knots, injuries or disfigurations.
- d. Label or tag one of each variety of plant with proper botanical name identifying genus, species and (if applicable) variety.

2. Inspection and approval.

- a. Inspection location.
 - (1) Required upon delivery to site. All plants are to be inspected approved at the project site.
 - b. Plants not approved by Owner are to be removed from site immediately, and replaced with plants deemed suitable by the Owner at the Contractors expense.
 - c. The Owner shall have the right to inspect and reject unsatisfactory or defective plant material at any time during the progress of the work.
3. Seed (for temporary erosion control)
- a. Per Plan
- C. Pre-Emergence herbicide to be broad spectrum approved by the Owner and the Environmental Protection Agency.
- D. Post-Emergence herbicide to be broad spectrum approved by the Owner and the Environmental Protection Agency.
- 1. Contact weed killer that does not leave a stain or residue.
 - 2. Weed killer which utilizes the biological process of 'Translocation' to destroy all parts of the treated weed ("Roundup" by Monsanto).
- E. Topsoil
- 1. Imported topsoil to conform to Standard Specifications for Class "A" topsoil. Prior to delivery of topsoil, Contractor shall furnish a physical and chemical soil analysis (Agronomic Soils Test) from a competent soil testing laboratory which shall include compliance as follows:
 - a. Mechanical analysis and a permeability rate(s). Topsoil shall be of loamy texture.
 - b. Organic matter (loss of ignition) 6% by weight minimum based on the weight of the sample dried to constant weight at 100 to 110 degrees C. or as determined by the sulfuric acid test. When topsoil otherwise complies with the requirements of the Specification but shows a slight deficiency in organic matter content, humus, peat moss or other approved organic matter may be incorporated when and as permitted by the Owner.

- c. Boron analysis; 4 ppm, maximum.
 - d. pH value; 6.0 to 7.5.
 - e. Electrical conductance; maximum electrical conductivity of 4 millimhos/cm @ 25 degrees C.
- F. Mulch shall be manufactured from any clean, green softwood, free of diseases and pests. Chips from kiln-dried or air-dried material will not be accepted. Chips shall be produced by machinery equipped with knives or blades which cut, rather than shred or break, the material. Chips shall be graded so that substantially all chips are made from 1/2" to 3" in length, 1/2" to 1-1/2" in width, and from 1/8" to 1/2" in thickness. Chips may be produced from tree trimmings, however chips which contain trash or extraneous matter will not be accepted.
- G. Fertilizers and Soil Conditioners:
Schedule to be finalized upon completion of soil analysis, see Section 1.03A. For bidding purposes, use the following (final selection of soil conditioners, chemical and organic amendments and fertilizers shall be per soil analysis recommendations):
- 1. Soil Conditioners:
 - a. Material shall be fine textured, with 90% minimum passing a No. 8 screen, and 95% minimum passing a No. 4 screen.
Salinity: Not to exceed 3.5 millimhos per centimeter at 25 degrees C., as measured by saturation extract conductivity.

Organic Amendment: Provide one of the following:
 - 1) Nitrolized/mineralized Redwood sawdust (0.5% actual nitrogen).
 - 2) Nitrolized/mineralized Fir sawdust (0.8% actual nitrogen).
 - 3) Nitrolized/mineralized Fir bark (1% actual nitrogen).
 - b. Agricultural Gypsum: Standard commercial quality manufactured for use as a soil amendment as per soils report obtained upon completion of rough grading.
 - c. Iron Sulfate: Application rate per soils report.
 - 2. Fertilizers: Available from Tri-C Enterprises, LLC, 800-927-3311

- a. Tri-C Humate (Pre-plant soil conditioner)
- b. Tri-C Humate Plus (Hydroseeding)
- c. Tri-C 6-2-4 w/5% S (Post plant fertilizer)
- d. Tri-C Myco Paks (Native plants)
- e. Tri-C Myco Tabs (Pre-plant trees and shrubs)

Application Rates and Usage for Individual Plants and Trees:

PRODUCT	Liner/ 4"	1 Gallon	5 Gallon	15 Gallon	24" Box	36" Box	48" Box
ENDO 120GRANULAR	1-2 ml (pinch)	1 teaspoon	1 tablespoon	3 tablespoons	½ cup	1 cup	1 ½ cups
MYCO PAK Endo-Ecto PACKETS	Use Granular	1 pak	2-3 paks	6-8 paks	10-12 paks	16-18 paks	20-22 paks
MYCO TABS <i>Endo-Ecto Tablets</i> 17-9-5 NPK	1 Tab	2 Tabs	8 Tabs	16 Tabs	22 Tabs	28 Tabs	34 Tabs

PART 3 EXECUTION

3.01 ROOT ZONE PROTECTION

- A. Provide protection for the tree and root zone during construction with the following measures:
 - 1. Provide chain link fencing with an access gate if needed to protect the root zone. Tree roots are located in the upper 12- 18" of soil and extend to or beyond the tree canopy. Fencing location shall be approved by the Owner. Clippings from pruning mounded up to 3' high may be used to protect the root zone but there must still be the ability to effectively irrigate the root zone. Clippings more than 3" thick shall be removed after construction is completed.
 - 2. Root zone shall be irrigated with clean potable water to keep trees from becoming stressed during construction. Deep periodic watering may be required.

2. No trenching or cutting of roots allowed in the root zone without the presence of the Owner's Landscape Architect or Certified Arborist. Re-route pipes or cables elsewhere, tunnel under roots or run trenches radial to the trunk. Whenever possible the same trench should be used for multiple utilities.
 4. Avoid heavy machinery over the root zone. Soil compaction injures the tree by restricting the exchange of air and water. Work shall be accomplished with hand tools within the root zone.
 5. No construction staging, storage and disposing of materials shall be allowed within the root zone.
 6. Light pruning in the presence of the Owner's Landscape Architect or Certified Arborist may be performed to avoid damage to branches from construction vehicles or cranes.
- B. The adjoining soil should be maintained at the same grade as the root zone before and after construction. No soil shall be in contact with the trunk of the tree above the root flare. Where grade lowering is unavoidable and roots are cut, they should be clean cut with a sharp tool made at right angles to the roots. No more than 25% of the root zone shall be impacted or roots greater than 3" in diameter within 4' of the trunk, without an Arborist's report of tree condition and probability of survival and the Engineer's approval with the assistance of the Landscape Architect.

3.02 SOIL PREPARATION AND FINISH GRADING OF PLANTING AREAS

- A. For all planting areas, except slopes steeper than 4:1.
1. Prior to "ripping" soil, remove all vegetation (not shown to remain), stumps, roots, rocks, stones (larger than 1" in diameter) and all other deleterious material.
 2. "Rip" all planting areas to a depth of 12", using a ripper with teeth no wider than 12" o.c. The "ripping" shall be performed in two (2) directions unless contractor can show just cause for not proceeding in this manner.
 3. Fine grade planting areas so that there are no humps and hollows, and so that areas drain properly. All flow lines, designated or not, shall be graded and maintained to allow free flow of surface runoff. The finish grade of all planting areas shall be a min. of 1" below adjacent paving and curbs.
 4. If additional topsoil is required, Contractor to furnish good quality,

approved soil from an off-site location in accordance with the agronomic soils report.

- B. Grow and kill weeds to prepare for planting.
 - 1. Grade area to present a neat and uniform appearance. Finish grade to be 1" below adjacent paving.
 - 2. Moisten planting area for 14 days to encourage weed growth.
 - 3. Spray area with (Post-Emergence) weed killer to kill weeds.
 - 4. After weeds are dead, remove all dead weeds and grasses.
 - 5. Repeat moistening soil until 90% of all weed growth reaches a minimum 2" height.
 - 6. Spray area again with (Post –Emergence) weed killer to kill weeds.
 - 7. Remove all dead weeds and grasses.
 - 8. Sufficiently moisten ground to dissipate any remaining weed killer.
- C. Spread three (3) cu. yds. of shavings, 50 lbs, Tri-C Humate and 15 lbs of (6-20-20) commercial fertilizer per 1000 SF. Cultivate to a depth of 6" in two directions so shavings are uniformly mixed.
- D. Cultivate planting areas, except slopes steeper than 4:1, to a depth of 6". Uniformly smooth grade all planting areas so that there are no humps and hollows, and so that areas drain properly. All flow lines, designated or not, shall be graded and maintained to allow free flow of surface runoff. The finish grade of all planting areas shall be a min. of 1" below adjacent paving, curbs and mowing strips. If additional topsoil is required, Contractor to furnish good quality, approved soil from an off-site location.

3.03 PLANTS

- A. Locating, planting, staking and tying of trees; followed by planting of shrubs.
 - 1. All plants are to be furnished and planted by the Contractor.
 - 2. Contractor shall locate all 15 gallon and larger containers, trees and shrubs, as shown on plans. Prior to excavating and planting of container Contractor must secure approval of Owner. Locate the planting pit using one (1) of the following methods:
 - a. Place 1" x 3" x 3'-0 wood stake at the location shown on the plans. Write botanical name and size of container on stake.
 - b. Place plant container at location shown on the plans.
- B. Trees and shrubs are to be planted before hydromulch operations, if applicable.

- C. Plant pits. In instances where a mechanical digging device is used to excavate plant pits - rough "Score" vertical sides and bottom of plant pit to loosen soil to eliminate "Glazed" sides and bottom.
1. Plant containers up to, and including, 15 gallon are to be placed in a planting pit having vertical sides, be three (3) times wider than the width of the plant ball, and no deeper than the height of the plant ball.
 2. Plant containers, 24" and larger, are to be placed in a planting pit having vertical sides, be two (2) times wider than the width of the plant ball and be no deeper than the height of the plant ball.
- D. Backfill.
- Prepare backfill mix as specified within this section. Set plant on undisturbed grade at bottom of plant pit.
- E. Construction of plant-watering basins.
- Construct a berm, 3" above finish grade that forms a watering basin, with a level bottom, around each plant. Watering basin to be 1-1/2 times the diameter of plant ball.
- F. Plants shall not be allowed to dry out before or while being planted. Keep exposed roots moist at all times during planting operations, do not expose to the air except while being placed in the ground. Wilted plants, whether in place or not, will not be accepted and shall be replaced at the Contractor's expense.
- G. Water plants immediately after planting and as specified within this section under the heading of "Watering."
- H. Mulch trees and shrubs with prepared mulch, as follows:
1. All planted areas shall receive uniform 3" thickness of mulch. Slopes steeper than 2:1 are not to be mulched.
 2. Each container plant shall have two (2) containers full of prepared mulch in watering basin no more than a 3" layer and placed in 4-6 inches from the trunk. Container size to be same as plant container.
- I. Stake all trees in two (2) locations, at time of planting, by driving stake at southwest and northeast edge of plant ball, unless otherwise specified. Fasten tree to upper end of stake, with tree ties indicated, in two (2) places for each stake. Staking shall be uniform throughout entire project.

3.04 WATERING

- A. Apply water to all planted areas and plants, during operations and thereafter, until acceptance of work.
- A. Immediately after planting, apply water to each tree and shrub by means of a hose. Apply water in a moderate stream in the planting hole until the material about the roots is completely saturated from the bottom of the planting pit to finish grade.
- C. Apply irrigation at sufficient intervals, and as often as seasonal conditions require, to keep the ground moist. Exercise care to prevent overwatering, flooding or excessive runoff.

3.05 HYDROSEEDING

- A. Hydroseed shall be applied to all areas disturbed by construction activities and those areas not planted with shrubs/groundcover. This application shall occur after the trees and shrubs have been planted.
- B. Quality of Work: The hydroseeding work shall be performed by a competently trained individual or hydroseeding company in accordance with the best standards related to the trade.
- C. Preparation for Hydroseeding: Water all planting areas thoroughly and continuously prior to hydroseeding operation.
- D. Time Limit: The hydromulching slurry components are not to be left in the hydromulch machine for more than two (2) hours. If slurry components are left for more than two (2) hours in the machine, the Contractor shall add 50 % more of the originally specified seed mix to any slurry mix which has not been applied within the two (2) hours after mixing. The Contractor shall add 75 % more of the original seed mix to any slurry mixture which has not been applied after eight (8) hours after mixing. Any mixture not applied after eight (8) hours, shall be rejected and disposed of off-site at Contractor's expense.
- E. Protection: Special care is to be exercised by the Contractor to prevent any of the slurry from being sprayed onto any adjacent property, drainage ditches, channels, structures, roads and walkways. Any slurry sprayed onto these areas, shall be cleaned off at the Contractor's expense.
- F. Hydroseeding Components per acre:

Tri-C Humate Plus	600 lbs per acre
Tri-C Endo 120	60 lbs per acre

Cellulose fiber mulch:	2000 lbs per acre
Binder (granular):	80 lbs per acre
Seed Mix:	Per Plan

- G. Hydroseeding Equipment: The specified components shall be mixed together in a hydroseeding machine described as follows:
1. The hydromulching equipment shall meet the minimum requirements of a slurry distribution line large enough to prevent closing and shall be equipped with a set of hydraulic spray nozzles which will provide a continuous nonfluctuating discharge of at least 25 psi at the end of the spray nozzle.
 2. The slurry tank shall have a minimum capacity of 2000 gallons and shall be mounted on a traveling unit either self-propelled or drawn by a separate unit.
 3. The equipment shall have a built-in agitation system under operating capacity sufficient to agitate, suspend and homogeneously mix a slurry containing not less than twenty (44 pounds) of organic mulching amendment plus fertilizer chemical additives and solids for each one hundred (100) gallons of water.
- H. Soil Stabilization and Hydroseeding: All materials shall be of standard, approved, first grade quality and in prime condition when installed. All commercial processes or packaging material shall be delivered to the site in their original unopened containers bearing the manufacturer's guarantee analysis.

Hydromulching Application and Planting Schedule

The hydromulching shall be applied in the form of a slurry consisting of organic soil amendments, commercial fertilizer and other chemicals called for. When hydraulically sprayed onto the soil, the mulch SHALL NOT FORM A BLOTTER LIKE MATERIAL. The spray operation must be so directed that the slurry spray will also penetrate the soil surface as to drill and mix the slurry components into the soil, thus ensuring maximum impregnation and coverage.

- I. Preparation of Hydroseeding Mixture: The slurry shall be prepared at the site and its components shall be mixed to supply the rates of application as per specifications.
1. Slurry preparation shall begin by adding water to the tank when the engine is at on-half throttle. Then when the water level has reached the height of the agitator shaft and good recirculation has been

established, the fertilizers shall be added to the mixture (the tank shall be at least 1/3 filled with water at this time).

2. The engine throttle shall be open to full speed when the tank is 1/2 filled with water. All organic amendments, fiber and chemicals shall then be added by the time the tank is 2/3 to 3/4 full. At this time, the seed mix shall also be added.
 3. Spraying shall commence when the tank is full and the slurry is mixed.
- J. Application: The operator shall spray the area with a uniform visible coat using the dark color of the cellulose fiber or organic amendment as a visual guide. The slurry shall be applied in a downward drilling motion via a fan stream nozzle. The Contractor shall be responsible for protecting the trees and shrubs from being covered by hydroseed mulch by either washing the leaves immediately or covering the plants before hydroseeding.
- K. Weeding: Any concentrated development of weed growth appearing in the seed mix planting areas during the maintenance period shall be removed at thirty (30) day intervals. The Contractor may elect to remove such concentrations of weeds manually or by an approved herbicide process. One month after hydroseeding the area directly below the plant canopy shall be cleared to allow the plant material to grow.

3.06 PLANT ESTABLISHMENT PERIOD

- A. The entire project shall be cared for, to the satisfaction of the Owner, in such a manner as to present a neat and clean condition at all times.
- B. Maintain all planting in a thriving condition, to the satisfaction of the Owner, for 90-calendar days after all foregoing work is completed and approved.
 1. During the final 30-day period all plants and planted areas shall be kept well watered and weed free at all times. Weeds include Dallisgrass, Johnson Grass, Sow Thistle, Thistle, Dandelion, Palm Tree Seedlings, Seedling Trees, Fountain Grass, Bermudagrass, Spurge, Nutsedge, Plantains, and Clover.
 2. Upon completion of all planting operations, apply pre-emergent weed control over all shrub areas in accordance with manufacturer's recommendations.
 3. Control all harmful insects and fungi using appropriate insecticides and fungicides.

- C. Replacements. Immediately replace any and all plant materials which, for any reason, dies, is unhealthy or is damaged. Any trees or other plant materials that die back and lose the form and size as originally specified shall be replaced, even though they have taken root and are growing after the die-back. Replacement shall be made with plants as indicated or specified for the original planting. All replacement of plant material shall be at the expense of the Contractor.
- D. Repair. Damage to planting areas shall be replaced and repaired immediately.
1. Depressions caused by erosion, vehicles, bicycles or foot traffic is to be filled with topsoil and leveled.
- E. Exterminate gophers and moles and repair damage, as approved by Owner.
- F. Herbicides, fungicides, insecticides, baits and other chemicals shall be used in strict accordance with manufacturer's recommendations and regulatory agencies.
- G. The Contractor will be relieved of maintenance work when the final 90-calendar day plant establishment work has been satisfactorily completed. If maintenance is unsatisfactory, Contractor shall maintain work beyond the 180 calendar day period until all planting is in a healthy thriving condition as determined by the Owner. Final acceptance of landscape work will relieve Contractor from maintaining all planting.
- H. Turf:
1. The establishment of turf includes all the work normally required to establish the sod and to grow a healthy, uniform turf of smooth and even textures and grades.
 2. Between the 15th and 20th days of the maintenance period, re-sod all spots or areas in which normal rooting is not evident.
 3. Within the first 20 days of maintenance period:
 - a. Remove all rocks or other debris that would constitute a hindrance to subsequent mowings or present an untidy appearance.
 - b. Repair all damage caused in performance of work.
 - c. Fill all depressions and eroded channels with sufficient backfill mix to raise to proper grade.
 - d. Roll all lawn areas with a roller weighing approximately 16 pounds per lineal inch to compact the soil around the roots and provide a smooth, even mowing surface.

- e. Mow warm season Bermuda first to 1 – 1 ½ inches, then at subsequent mowings, down to 1 inch then down to ½ inch.
 - f. Core five 1-inch diameter holes to a depth of 18-inches with a soil probe evenly spaced at the dripline of each tree. Do not remove turf to create basins around trees in lawn areas.
- 4. Grass clippings shall be removed off-site.
 - 5. All turf shall be mowed at least once a week.
 - 6. Fertilize two (2) times before acceptance.
 - 7. Paved Areas: Clean all paved areas of debris or silt by sweeping and hosing.

3.07 INSPECTION

- A. Written notice requesting an inspection shall be submitted to the Owner at least 10 days prior to the anticipated date.
- B. The following inspections are required.
 - 1. Inspections to be performed by the Owner with the assistance of the Landscape Architect.
 - a. Plants, after delivery to site. (24" box. and larger)
 - b. Plants and specimen plants (larger than 24" box) at source, before delivery.
 - 2. Inspections to be performed by the Owner Inspector and Owner Landscape Architect.
 - a. Plant locations prior to excavation of plant pits.
 - b. Planting installation and backfill.
 - c. All landscape construction items, prior to the start of the 90-calendar day Plant Establishment Period.
 - (1) Contractor shall insure that all landscape construction items are properly placed, all plants are in place in a healthy condition, areas are clean and free of weeds and debris, and entire area is in a neat condition prior to scheduling an inspection for beneficial occupancy at the beginning of the maintenance period and all

subsequent inspections.

- d. At completion of initial 30 calendar day Plant Establishment Period.
- e. At completion of 90-calendar day Plant Establishment Period.

END OF SECTION 02900 LANDSCAPING

SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Provide formwork in accordance with provisions of this Section for cast-in-place concrete shown on the Drawings or required by other Sections of these Specifications.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 03200: Concrete reinforcement.
 - 3. Section 03300: Cast-in-place concrete.

1.02 SUBMITTALS

- A. Comply with pertinent provisions of Division 1.
- B. Product data: Within 14 calendar days after the Contractor has received the Owner's Notice to Proceed, submit manufacturers' data and installation instructions for proprietary materials including form coatings, ties, and accessories, and manufactured form systems if used.

1.03 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Design of formwork is the Contractor's responsibility.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Comply with pertinent provisions of Division 1.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Except for metal forms, use new materials. Materials may be re-used during progress of the Work, provided they are completely cleaned and reconditioned, recoated for each use, and capable of producing formwork of the required quality.
- B. For footing and foundations, use Douglas Fir "standard" grade or better boards or planks secured to wood or steel stakes, substantially constructed to shapes indicated and to support the required loads.
- C. For studs, wales, and supports, use Standard grade or better Douglas Fir, dimensions as required to support the loads but not less than 2" x 4".
- D. Wall forms:
 - 1. Exposed concrete surfaces:
 - a. Use 3/4" minimum thickness Douglas Fir plywood, grade B/B, class I or II, exterior, sanded both sides, complying with PS-1.
 - b. Seal edges and coat both faces with colorless coating which will not affect application of applied finishes.
 - 2. Unexposed concrete surfaces:
 - a. Use 1" x 6" shiplap Douglas Fir boards, surfaced one side and two edges, or 3/4" minimum thickness Douglas Fir plywood, grade B/B plyform class I or II, sanded both sides, mill-oiled.

2.02 FORM TIES

- A. Hold inner and outer forms for vertical concrete together with combination steel ties and spreaders approved by the Owner.
 - 1. Space ties symmetrically in tiers and rows, each tier plumb from top to bottom and each row level.
 - 2. At horizontal pour lines, locate ties not more than 6" below the pour lines. Tighten after concrete has set and before the next pour is made.
 - 3. For exposed concrete surfaces, provide form ties of removable type

with she-bolts equipped with permanent plugs and a system approved by the Owner for fixing the plugs in place.

2.03 DESIGN OF FORMWORK

A. General:

1. Design, erect, support, brace, and maintain formwork so that it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure.
2. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose.
3. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.
4. Design forms and false work to include assumed values of live load, dead load, weight of moving equipment operated on the formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of the structure during construction.
5. Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof.
6. Support form materials by structural members spaced sufficiently close to prevent objectionable deflection.
7. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities, and within the allowable tolerances.
8. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints, and provide backup material at joints as required to prevent leakage and prevent fins.

2.04 EARTH FORMS

- ### A.
- Side forms for footings may be omitted, and concrete may be placed directly against excavation, only when requested by the Contractor and approved by the Owner.

- B. When omission of forms is accepted, provide additional concrete 1" on each side of the minimum design profiles and dimensions shown on the Drawings.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 FORM CONSTRUCTION

- A. General:

1. Construct forms complying with ACI 347 to the exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, and level and plumb work in the finished structure.
2. Provide for openings, offsets, keyways, recesses, moldings, reglets, chamfers, blocking, screeds, bulk-heads, anchorages, inserts, and other features as required.

- B. Fabrication:

1. Fabricate forms for easy removal without hammering or prying against concrete surfaces.
2. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
3. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and assure ease of removal.
4. Provide top forms for inclined surfaces where so directed by the Engineer.

- C. Forms for exposed concrete:

1. Drill forms to suit ties being used, and to prevent leakage of cement paste around tie holes. Do not splinter forms by driving ties through improperly prepared holes.

2. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back the joints with extra studs or girts to maintain true, square intersections.
 3. Use extra studs, wales, and bracing to prevent objectionable bowing of forms between studs, and to avoid bowed appearance in concrete. Do not use narrow strips of form material which will produce bow.
- D. Corner treatment:
1. Unless shown otherwise, form chamfers with 3/4" x 3/4" strips, accurately formed and surfaced to produce uniformly straight lines and tight edges.
 2. Extend terminal edges to required limit, and miter the chamfer strips at changes in direction.
- E. Locate control joints as indicated on the Drawings and, where required but not shown on the Drawings, as approved by the Engineer.
- F. Provisions for other trades:
1. Provide openings in concrete formwork to accommodate work of other trades.
 2. Verify size and location of openings, recesses, and chases with the trade requiring such items.
 3. Accurately place and securely support items to be built into the concrete.

3.03 FORM COATINGS

- A. Coat form contact surfaces with form coating compound before reinforcement is placed.
1. Do not allow excess form coating material to accumulate in the forms or to come in contact with surfaces which will bond to fresh concrete.
 2. Apply the form coating material in strict accordance with its manufacturer's recommendations.

3.04 REMOVAL OF FORMS

- A. General:

1. Do not disturb or remove forms until the concrete has hardened sufficiently to permit form removal with complete safety.
2. Do not remove shoring until the member has acquired sufficient strength to support its own weight, the load upon it, and the added load of construction.
3. Do not strip floor slabs in less than two days.
4. Do not strip vertical concrete in less than seven days.

B. Finished surfaces:

1. Exercise care in removing forms from finished concrete surfaces so that surfaces are not marred or gouged.
2. Release sleeve nuts or clamps, and pull the form ties neatly.
3. Do not permit steel spreaders, form ties, or other metal to project from, or be visible on, any concrete surface except where so shown on the Drawings.
4. Solidly pack form tie holes, rod holes, and similar holes in the concrete. For packing, use the cement grout specified in Section 03300 of these Specifications, flushing the holes with water before packing, screeding off flush, and grinding to match adjacent surfaces.
5. "Sack" entire concrete finish to the satisfaction of the Owner when required.

PART 4 MEASUREMENT AND PAYMENT (NOT USED)

END OF SECTION 03100 CONCRETE FORMWORK

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Provide concrete reinforcement where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 03100: Concrete formwork.
 - 3. Section 03300: Cast-in-place concrete.

1.02 SUBMITTALS

- A. Comply with pertinent provisions of Division 1.
- B. Product data: Within 14 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Shop Drawings showing details of bars, anchors, and other items, if any, provided under this Section.

1.03 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Comply with pertinent provisions of the following, except as may be modified herein:

1. ACI 318;
2. CRSI "Manual of Standard Practice."

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Comply with pertinent provisions of Division 1.
- B. Delivery and storage:
 1. Use precautions to maintain identification after bundles are broken.
 2. Store in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.

PART 2 PRODUCTS

2.01 REINFORCEMENT MATERIALS AND ACCESSORIES

- A. Bars:
 1. Provide deformed billet steel bars complying with ASTM A615, using grades shown on the Drawings.
 2. Where grades are not shown on the Drawings, use grade 60.
 3. Material should have recycled content as specified in LEED matrix.
- B. Steel wire:
 1. Comply with ASTM A82.
 2. For tie wire, comply with Fed Spec QQ-W-461, annealed steel, black, 16 gage minimum.
Material should have recycled content as specified in LEED matrix.
- C. Welded wire fabric:
 1. Provide welded steel, complying with ASTM A185.
- D. Welding electrodes:
 1. Comply with AWS A5.1, low hydrogen, E70 series.
- E. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place:

1. Use wire bar type supports complying with CRSI recommendations, unless otherwise shown on the Drawings.
2. Do not use wood, brick, or other non-complying material.
3. For slabs on grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
4. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with either hot-dip galvanized or plastic-protected legs.

2.02 FABRICATION

A. General:

1. Fabricate reinforcing bars to conform to the required shapes and dimensions, with fabrication tolerances complying with the CRSI Manual.
2. In case of fabricating errors, do not straighten or rebend reinforcement in a manner that will weaken or injure the material.
3. Reinforcement with any of the following defects will not be acceptable.
 - a. Bar lengths, depths, and/or bends exceeding the specified fabrication tolerances;
 - b. Bends or kinks not shown on the Drawings;
 - c. Bars with reduced cross-section due to excessive rusting or other causes.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General:

1. Comply with the specified standards for detail and method of placing reinforcement and supports, except as may be modified herein.

2. Clean reinforcement to remove loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.
 3. Position, support, and secure reinforcement against displacement by formwork, construction, and concrete placing operations.
 4. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
 5. Place reinforcement to obtain minimum coverage for concrete protection.
 6. Arrange, space, and securely tie bars and bar supports together with the specified wire.
 7. Set tie wires so twisted ends are directed away from exposed concrete surfaces.
- B. Install welded wire fabric in as long lengths as practicable, lapping adjoining pieces at least 12".
- C. Provide sufficient numbers of supports, and of strength to carry the reinforcement.
- D. Do not place reinforcing bars more than 2" beyond last leg of any continuous bar support.
- E. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

3.03 SPLICES

- A. Lap splices:
1. Tie securely with the specified wire to prevent displacement of splices during placement of concrete.
- B. Splice devices:
1. Obtain the Owner's approval prior to using splice devices.
 2. Install in accordance with manufacturer's written instructions.
 3. Splice in a manner developing at least 125% of the yielding strength of the bar.

C. Welding

1. Perform in accordance with AWS D1.4-79.

D. Do not splice bars except at locations shown on the Drawings, except as otherwise specifically approved by the Engineer.

3.04 TESTING

A. Samples:

1. Samples for physical tests of reinforcement will consist of at least two pieces, each 18" long, of each size of reinforcement steel, selected by the testing agency from material at the building site or at the fabricator's or supplier's yard.
2. Material to be sampled at the building site shall have been delivered thereto at least 72 hours before it is needed.

B. Tests:

1. Where samples are taken from bundles as delivered from the mill, with the bundles identified as to heat number, and provided mill analyses accompany the report, then one tensile test and one bend test will be made from a specimen of each ten tons or fraction thereof of each size of reinforcement steel.
2. Where positive identification of the heat number cannot be made, or where random samples are taken, then one series of tests will be made for each 2-1/2 tons or fraction thereof of each size of reinforcement steel.
3. Payment for testing is described in Section 01410 of these Specifications.

END OF SECTION 03200 CONCRETE REINFORCEMENT

SECTION 03270

GROUT-SET AND ADHESIVE ANCHORS

PART 1 GENERAL

1.01 DESCRIPTION

A. Work included:

1. Grout setting and furnishing of dowels or threaded rods in new concrete footings.
2. Providing and setting of adhesive anchors.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions to the Contract for Construction, Supplementary Conditions to AIA Document A201, and other Sections in Division 1 of these Specifications
2. Cast-In Place Concrete - Section 03300
3. Concrete Unit Masonry - Section 04230.

1.02 QUALITY ASSURANCE

A. Codes:

1. County of Riverside Building Code, Latest Edition, published by the County of Riverside.
2. Standards: American Society of Testing and Materials (ASTM)
 - a. ASTM A 307 Carbon Steel Externally Threaded Fasteners
 - b. ASTM A 615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

B. Testing and Inspections:

1. Continuous inspection is required for installation of all grouted and adhesive anchors, unless noted otherwise on the structural drawings. Prior to placing anchors, holes shall be inspected for compliance to specifications by Registered Deputy Inspector.

1.03 SUBMITTALS

- A. Manufacturers' printed data and specification sheets:
 - 1. Grout setting compound.
 - 2. Special manufactured epoxy-based grouting systems, if used or indicated on the Drawings. Include instruction sheet.
 - 3. Adhesive anchors. Include instruction sheet.

1.04 PRODUCT DELIVERY

- A. Deliver manufactured materials in original unopened packages, containers, or bundles with manufacturer's label intact and legible.
- B. Store all materials off the ground, under cover, and away from damp surfaces.

PART 2 PRODUCTS

2.01 GROUTING SYSTEM

- A. Non-catalyzed, metallic aggregate, non-shrink, fluid, high strength grout, "Embeco 636" by Master Builders Co., as covered by L.A. Research Report No. 23137. Use at all setting conditions.

2.02 ADHESIVE ANCHORAGE SYSTEMS

- A. Threaded Bar and Rebar in Concrete: "Covert Injection Adhesive (CIA) Epoxy Anchors" as covered by L.A. City Research Report No. 25113, or other manufacturer's as noted on the structural drawings.

2.03 DOWELS AND THREADED RODS

- A. Dowels: Grade 60 deformed reinforced bars conforming to ASTM A615 and of an adequate length as indicated on the Drawings.
- B. Threaded Rods: All-thread carbon steel rods conforming to ASTM A307 or ASTM A325, with tooled or cut threads and of an adequate length as indicated by the drawings.
- C. Cleaning: Before placing, remove all oil, grease, paint, loose mill scale, and rust or any other coating that could reduce bond.

2.04 EQUIPMENT

A. Drilling Equipment:

1. Rotary drills producing a smooth hole shall be used. Pneumatically-powered percussion drilling equipment or any drilling equipment which produces substantial vibrations which weaken the mortar bond in masonry shall not be used in masonry. Pneumatically-powered percussion drilling equipment may be used for drilling in concrete if it does not damage the concrete.

2.05 FABRICATION

- ### A. Use only clean deformed bars or rods as shown. Install nut and washer on one end of anchor bolt, as required to make connections as shown.

PART 3 EXECUTION

3.01 INSTALLATION OF GROUT ANCHORS

- #### A. Drilling: To depth and diameter indicated on the Drawings, with clean, smooth hole sides and no oil or embedded dust. Blow out residual dust and chips. Use equipment as noted in Item No. 2.04 A.
- #### B. Schedule of Hole Sizes: All holes shall be per manufacturer's requirements and specifications.
- #### C. Mixing of grout: Conform to manufacturer's written directions. Do not mix more than can be placed in 20 minutes. Do not re-temper grout.
- #### D. Installing Anchor Bolt: Place end of bolt with nut and washer to the end of the hole. Use template or automatic centering device to center bolt in the hole. Protect until grout has set.
- #### E. Installing Grout:
1. Vertical downhand holes may be poured.
 2. Horizontal and 22 degree holes: Mix grout to consistency of drypack and tamp so that the grout completely fills the hole and embeds the anchor bolt.

3.02 INSTALLATION OF ADHESIVE ANCHORS

- #### A. Installation of Adhesive Anchors:

1. Conform to manufacturer's detailed published instructions for installation of anchors and according to the referenced Research Report.

3.03 INSTALLATION OF EPOXY DOWELS IN CONCRETE

- A. Conform to manufacturer's detailed published instructions for installation of anchors and according to the referenced Research Report. Use equipment as noted in Item No. 2.04 A.
- B. Epoxy grouted dowels into existing concrete shall be embedded a minimum of 16 bar diameters, unless otherwise noted on the drawings.

END OF SECTION 03270 GROUT-SET AND ADHESIVE ANCHORS

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Provide cast-in-place concrete where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 03100: Concrete formwork.
 - 3. Section 03200: Concrete reinforcement.

1.02 SUBMITTALS

- A. Comply with pertinent provisions of Division 1.
- B. Product data: Within 14 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
- C. Mix designs prepared by a qualified, registered engineer for each different concrete mix used shall be submitted to the Structural Engineer for review.

1.03 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Quality control:

1. Do not commence placement of concrete until mix designs have been reviewed and approved by the Engineer and all governmental agencies having jurisdiction, and until copies are at the job site and the batch plant.
2. Tests for Cement and Aggregates: As required by the Engineer at the expense of the Owner.
3. Also see other requirements for testing stated in Part 3 of this Section.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Comply with pertinent provisions of Division 1.

PART 2 PRODUCTS

2.01 CEMENT

- A. Provide a standard brand of portland cement complying with ASTM C150, type I or II, low alkali (not to exceed 0.6%). Do not change the brand of cement during progress of the Work except as approved in writing by the Engineer.

2.02 AGGREGATES

- A. General:

1. Provide hardrock aggregate complying with ASTM C33, with additional attributes as specified herein, from San Fernando Valley Sources.
2. For making grading tests of fine and coarse aggregate, use square mesh wire cloth complying with ASTM E11.
3. Certificates required for aggregates: From the aggregate dealer, prior to use and delivery to the job-site, stating the natural geographic source of fine and coarse aggregates.

- B. Fine aggregate:

1. Provide washed natural sand having strong, hard, durable particles, and containing not more than 2% by weight of deleterious matter such as clay lumps, mica, shale, or schist.

2. Grade from coarse to fine within the following limits:
Sieve Percentage by weight passing sieve:

<u>Size:</u>	<u>Minimum:</u>	<u>Maximum:</u>
3/8"	100	---
No. 4	95	100
No. 8	65	95
No. 16	45	75
No. 30	30	50
No. 50	10	22
No. 100	2	8

C. Coarse aggregates:

1. Provide coarse aggregate consisting of clean, hard, fine grained, sound crushed rock or washed gravel, or a combination of both, containing not more than 5% by weight of flat, chip-like, thin, elongated, friable, or laminated pieces, nor more than 2% by weight of shale or cherty material.
 - a. Any piece having a length in excess of five times the average thickness shall be considered flat or elongated.
2. Use coarse aggregate of the largest practicable size for each condition of placement, subject to the following maximum size limitations:
 - a. Do not exceed 3/4 of the clear distance between reinforcing bars, 1/5 of the narrowest dimension between sides of forms, or 1/3 of any slab section.
3. Grade combined aggregates within the following limits:

<u>Sieve size or size in inches:</u>	<u>Percentage by weight passing sieve:</u>					
	<u>1-1/2" aggregate:</u>		<u>1" aggregate:</u>		<u>3/4" aggregate:</u>	
	<u>Min:</u>	<u>Max:</u>	<u>Min:</u>	<u>Max:</u>	<u>Min:</u>	<u>Max:</u>
1-1/2"	95	---	---	---	---	---
1"	5	90	90	100	---	---
3/4"	55	77	70	90	90	100
3/8"	40	55	45	65	60	80
No. 4	30	40	31	47	40	60
No. 8	22	35	23	40	30	45
No. 16	16	30	17	35	20	35
No. 30	10	20	10	23	12	23
No. 50	2	8	2	10	5	15

No. 100 0 3 0 3 0 5

D. Lightweight aggregate, coarse and fine: Provide rounded, sealed, expanded shale or clay conforming to ASTM C330.

E. Tests: As required by the Engineer, at the expense of the Contractor.

2.03 WATER

A. Use only water which is clean and from deleterious amounts of acid, alkali, salt, and organic matter.

2.04 ADMIXTURES

A. Use only a standard brand of admixture for concrete, upon written approval by the Engineer.

2.05 OTHER MATERIALS

A. Abrasive: Provide as specified in Section 03345.

B. Expansion joint filler:

1. Provide preformed strips, non-extruding and resilient bituminous type, of thickness indicated, not less than 3/8", complying with ASTM D1751.

2. If sealants specified in Section 7 are used in the joints built under this Section, provide a filler complying with ASTM D1752.

3. Expansion joint fiber filler: ASTM D-1751-83, Federal Specification HH-F-341e; thickness as indicated on drawings, not less than 1/2".

C. Curing materials:

1. Curing paper: Comply with ASTM C171.

2. Liquid curing compounds: Provide as specified in Section 03345.

D. Floor hardener: Provide as specified in Section 03345.

E. Moisture Barrier: 10-mil thick polyethylene sheeting, "Vis-Queen" or "Ger-Pac". Pressure sensitive tape: Federal Specification PPP-T-606, Class I.

F. Anti-Bonding Agent: "Thompson's Water Seal" as manufactured by E.A. Thompson Company, Inc., San Francisco, California.

- G. Non-Shrink Grout: No. 713 "Master Flow" as manufactured by Master Builders Company, Los Angeles, California, "Embeco" pre-mixed grout, or approved equal.
- H. Plastic Control Joint: "T" shaped plastic strip, 1/16-inch thick by at least 1 inch deep, with suitable anchor to prevent vertical movement and with minimum 3/4-inch wide pulltop stiffener.

2.06 CONCRETE MIXES

- A. Provide a mix design prepared by the approved testing agency, based on strengths of the approved materials, and meeting the requirements stated on the Drawings.
 - 1. Secure the Engineer's approval of each mix design, including new mix designs required to be prepared should there occur a change in materials being used.
- B. Lightweight concrete:
 - 1. Design the mix in accordance with the provisions of ACI 613A, and pertinent requirements of governmental agencies having jurisdiction.
 - 2. Unless otherwise directed, use type II Portland cement and achieve a weight of not more than 110 pcf and an ultimate compressive strength of 3000 lbs at 28 days.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 CONCRETE MIXING

- A. Concrete for minor work, when approved by the Engineer, may be mixed at the site in a power mixer when the mixer has a capacity not less than one full sack batch.
- B. Unless otherwise approved by the Engineer, use ready mixed concrete complying with ASTM C94, except as may be modified by the following.

1. For materials for ready mixed concrete, and for methods of measuring materials, comply with applicable provisions of this Section.
2. Equip the loading plant to handle not less than four sizes of aggregate in such a manner as to prevent intermixing of aggregates until loaded into the weighing hopper.
3. Equip truck mixers with a mixing water tank fitted with a water gage.
4. Mixing:
 - a. Mix each batch of concrete not less than 15 minutes, five minutes of which shall be at the site.
 - b. Rotate the drum at the rate specified by the manufacturer of the mixer as "mixing speed."
 - c. Whenever there is a delay in unloading, rotate the drum slowly at intervals to prevent incipient set of concrete.
5. Addition of water:
 - a. Normally, do not deliver concrete with total permissible amount of water incorporated therein.
 - b. Unless otherwise approved by the Engineer, withhold at least 2-1/2 gal per cu.yd and add before the concrete is discharged but only under observation of the Engineer or designated inspector.
 - c. After water is added, at least five minutes of mixing time shall be immediately prior to discharge.
 - d. Concrete will be rejected if not placed in final position within 1-1/2 hours after water is first added to the batch.
6. Concrete at time of placing shall be in such condition that it can be placed properly.
7. Discharge all wash water from the mixing drum before the truck reloads at the batching plant.

C. Concrete consistency:

1. Use the amount of water established by the approved mix design.
 - a. Do not exceed the maximum quantity specified for the grade of concrete.
 - b. Use the minimum amount of water necessary to produce concrete of the workability required by the Engineer.
 - c. Do not supplement the predetermined amount of water with additional water for any reason.

2. Tests for concrete:
 - a. Contractor will take samples of mixed concrete at each pour, as directed by the Inspector, for slump and compression tests, ASTM C-143 and ASTM C-31.
 - b. Prerogative of City to take samples and make any tests deemed desirable of any concrete or concrete materials, without expense to the Contractor.
 - c. Compression Tests: By private laboratory, selected by and paid for by the Contractor: ASTM-C-39
 3. Provide maximum slumps of concrete as:
 - a. Footings, and slabs on soil: 4";
 - b. Other concrete: 4".
- D. Cement grout and dry-pack grout:
1. Mix at the site, in composition of one volume of Portland cement to 2-1/2 volumes of fine aggregate.
 2. Mix the materials dry; then add sufficient water to make the mixture flow under its own weight.
 3. When grout is used as a dry-pack concrete, add sufficient water to make a stiff mixture which can be molded into a sphere.
- E. Miscellaneous provisions:
1. Provide strengths of concrete as shown on the Drawings.
 2. Provide concrete dense and free from honeycomb and other defects.
 3. Place and finish members to conform to the shapes and dimensions indicated, with all surfaces true to line, plumb, and level.

3.03 INSERTS, ANCHORS, AND EMBEDDED ITEMS

- A. Powder driven concrete fasteners:
1. In addition to their use where the pins are loaded in shear, powder driven concrete fasteners may be used in tension for support of light loads such as acoustical ceilings, duct work, conduits, pipes, and similar items when such loads are limited to less than 75 lbs.
 2. Testing:
 - a. Secure pre-qualifications of operator, tool, and fastener by an

approved testing agency, who shall observe testing of the first ten fastener installations.

- b. Apply a test "pull-out" load of not less than twice the design load or 150 lbs, whichever is the greater, to the pin in such a manner as not to resist the spalling tendency of the concrete surrounding the pin.
- c. Thereafter, secure random tests by the approved testing agency of approximately one in ten pins; except that when the design load exceeds 75 lbs, test one-half of the pins.
- d. Should failure occur on any pin tested, test all installations under observation of the approved testing agency, and replace all non-qualifying pins at no additional cost to the Agency
- e. Where "Red Head" or similar types of concrete anchor bolts are used for significant gravity loads or seismic anchorage, test in the presence of the approved testing agency:
 - (1) Proof test 50% of the bolts (alternate bolts in any group arrangement) to twice the allowable load;
 - (2) If there are any failures, also test the immediately adjacent bolt.

B. Reglets and rebates:

- 1. Form reglets and rebates as required to receive frames, flashing, and other equipment.
- 2. Verify the dimensions and positions of required reglets and rebates with trades whose work is related to or contingent upon such dimensions and positions.
- 3. If concrete slabs on earth join a wall or other perpendicular concrete surface, form a reglet in the wall to receive and carry the horizontal concrete work.
 - a. Provide reglet full thickness of the slab and 3/4" deep, unless otherwise shown on the Drawings.
 - b. Exterior walks need not be provided for in this way except where so detailed on the Drawings.

C. Embedded piping and rough hardware:

1. Coordinate the various trades who are required to fasten work to the structure, or are required to insert therein any sleeve, box, bolt, anchor, insert, or other rough hardware.
 2. Provide every facility for setting all required items accurately in the forms.
 3. Be responsible for changes in position of such items after they have been set.
 4. Provide in the forms for all sleeves, boxes, bolts, anchors, inserts, strap anchors for frames, and other rough hardware required for the Work, and which are shown or required to be embedded in the concrete.
 5. Conduits and sleeves:
 - a. Locate so as not to reduce the strength of construction. Do not place pipes, except conduits, in a slab of less than 3-1/2" thickness.
 - b. In supported concrete slabs, do not bury conduit having an outside diameter greater than 33% of the thickness of the slab. Increase slab thickness locally to meet this requirement.
 - c. Do not place conduit between the bottom of reinforcing steel and the bottom of supported slab.
 - d. In placing conduits at slabs on earth, place below the reinforcement, and encase in concrete by increasing thickness of the slab locally to at least 3" of concrete around the conduit on all sides. Where large amounts of conduit, pipe, etc are running clustered in slabs or walls to the extent that overall concrete strength could be compromised, the Contractor shall allow for additional re-bar to be placed at the discretion of the structural engineer. Note that arrangement of conduit shall be reviewed by the Contractor during bidding and the Contractor shall maintain an adequate allowance for additional reinforcing as required.
- D. Where openings in floors and walls are required by the various trades, but are not detailed on the Drawings, reinforce as directed by the Engineer.

3.04 CONVEYING AND PLACING CONCRETE

- A. Before placing concrete, thoroughly clean forms, wash out with water, and make tight.

B. Time of placing: Do not place concrete until reinforcement, conduits, outlet boxes, anchors, sleeves, hangers, bolts, and other embedded materials are securely and properly fastened in the correct positions.

C. Preparation:

1. Before new concrete is deposited upon or against concrete that has taken its initial set or has hardened, remove all incrustations from forms and reinforcement.
2. Remove all laitance, oil, and loose particles from concrete and concrete surfaces, and thoroughly clean the forms with water under stiff pressure.
3. Remove laitance after concrete has hardened partially (not less than two hours nor more than four hours after placing) by brushing with stiff bristles, or by directing a stream of water from a 1/4" nozzle, or by other method approved by the Engineer, to expose the clean top surface of the coarse aggregate.
4. Where cleaning is not satisfactory to the Engineer, sandblast the surface and then wash again.

D. Method of placing:

1. Place concrete only under the degree of inspection described elsewhere in these Specifications, and as required by governmental agencies having jurisdiction.
2. Do not place concrete outside of regular working hours unless required inspection authorities have been notified properly and are present.
3. Spouts, pipes, troughs, belts, chain buckets, and other equipment may be used in conveying concrete, but the manner and method used shall be only as approved by the Engineer.
4. Do not permit concrete to free drop more than 6'-0".
5. Deposit concrete direct into conveyances, and direct from conveyances to final points of repose, except where troughs, buckets, or the like are used, in which case dump concrete into hoppers and then into the conveyances.
6. Where tremies are used, or where the free drop is 5'-0" or more, and

through reinforcement, use a dumping box or board, moving the concrete there/from by shovels or hoes.

7. Deposit concrete so that the surface is kept level throughout, a minimum being permitted to flow from one position to another, and place as rapidly as practicable after mixing.
8. Do not use in this Work any concrete not placed within 30 minutes after leaving the mixer.

E. Tamping and conveying:

1. Thoroughly work concrete around reinforcement and embedded fixtures, and into corners of forms, during placing operations.
2. Completely compact with tamping poles and by tapping forms until the concrete is thoroughly compact and without voids. Determine the number of tampers needed by the amount and method of placing concrete.
3. Exercise care to tamp concrete vigorously and thoroughly to obtain maximum density.
4. Use manual tampers as well as mechanical vibrators.
 - a. Exercise care to direct the quick handling of vibrators from one position to another.
 - b. Do not over-vibrate concrete.
 - c. Do not move concrete by use of vibrator.

F. Stoppages:

1. General: Construction joints in accordance with the Standard Specifications for Public Works Construction (the Greenbook) Paragraph 303-1.8.6 Joints. All joints subject to approval of the Engineer before placing of concrete, and as follows.
2. Maintain flow surface of freshly placed concrete as level whenever a pour is stopped, providing tight dams to accomplish this.
3. Make construction joints only where unavoidable, and then only at points determined by the Engineer.
4. Make horizontal construction joints only where shown on the Drawings or specifically approved by the Engineer.
5. Provide keys and dowels at all construction joints and where

placement is interrupted, or as indicated on the drawings.

3.05 CONCRETE FLATWORK FINISHING

- A. Except as may be shown otherwise on the Drawings, provide the following finishes at the indicated locations.
1. Trowel finish: Apply to monolithic slab surfaces that are to be exposed to view, unless otherwise shown, and to slab surfaces that are to be covered with resilient flooring, carpeting, paint, or other thin-film finish coating system.
 2. Non-slip broom finish: Apply to traffic surfaces at parking area, including driveway to street curb. Direction of broom texture at parking surfaces shall be as directed by Engineer. Broom finish shall be medium at exterior driveways, light at other locations. Textures shall match mock-up approved by Engineer.

3.06 STEPS, SLABS, WALKS, AND PAVING ON EARTH

- A. Preparation for slabs on earth:
1. Prepare the subgrade as specified in other Sections.
 2. Dampen the subgrade for exterior slabs and paving prior to placing concrete, but do not dampen subgrade at interior floor slabs.
 3. Provide the specified vapor barrier membrane, with the bedding and covering shown on the Drawings, beneath floor slabs on grade.
 - a. Place the membrane in as large sheets as practicable, lapping 12", with the top lap placed in the direction concrete will be spread.
 - b. Carefully cut, fit, and seal the membrane to all pipes and conduits projecting through the membrane, using small sheets, where necessary, and pressure-sensitive tape.
 - c. Make necessary repairs to the membrane and secure as above before placing concrete.
 - d. Do not permit membrane to be punctured except at screed stakes and utility risers.
 - e. Sand Cover: Spread sand evenly on top of moisture barrier material to thickness indicated on the drawings, 2-inches minimum; exercise care in not damaging barrier material and make ready to receive subsequent materials.
 - f. Extend barrier material minimum 4-inches up wall or vertical surfaces; seal top edges with pressure-sensitized tape.

B. Placing and finishing:

1. Tamp the freshly placed concrete, except slabs to receive separate topping finish or mortar setting bed, using a heavy tamper, until at least 3/8" of mortar is brought to the surface.
2. Use tampers having a face consisting essentially of a grid of parallel metal bars.
3. Tamp with a light tamper, and screed with a heavy straightedge, until depressions and irregularities are worked out and the surface is true to finish grades and elevations.
4. Remove excess water and debris worked to the surface in compacting and screeding.
5. At slabs to receive separate topping finish or mortar setting beds, do not continue tamping to raise the mortar described in subparagraph 3.5-B-1 above.
6. Remove laitance as described in subparagraph 3.4-C-3 above.
7. When concrete has hardened sufficiently, float to a compact and smooth surface with power float, unless otherwise authorized.
8. Provide the finish surfaces shown on the Drawings or otherwise directed by the Engineer.
9. No mortar to be used for leveling surface.

C. Except as otherwise directed by the Engineer or called for in the Contract Documents, cure and protect concrete in accordance with pertinent provisions of ACI 302.

D. Joint in slabs on earth:

1. Building slabs on grade to be limited to approximately 900 square feet with construction joints located as shown on the drawings. Larger pours may be made with use of metal crack control joints as approved by the Engineer.
2. Construction joint may be used in lieu of control joint.
3. Fill joints flush with Traffic Grade Caulking, specified in Division 7.
4. Plastic Control Joints: After preliminary troweling of concrete slab,

part concrete slab, part concrete to a depth of 2-inches with a straightedge and insert plastic control joint strip so that stiffener (pull-top) be flush with top surface of concrete. Remove pull-top stiffener and then float finish slab to fill all voids adjacent to the strip. Trowel finish edges of joint to a radius of 1/8-inch using a slit jointer tool.

3.07 DEFECTIVE CONCRETE

- A. The following concrete will be deemed to be defective, and shall be removed promptly from the job site.
 - 1. Concrete which is not formed as indicated, is not true to intended alignment, is not plumb or level where so intended, is not true to intended grades and levels;
 - 2. Has voids or honeycomb that have been cut, resurfaced, or filled, except with the approval of the Engineer;
 - 3. Has sawdust, shavings, wood, or embedded debris;
 - 4. Or does not conform fully to provisions of the Contract Documents.
- B. Repairs and replacements:
 - 1. Where defective concrete is found after removal of the forms, cut out the defective concrete, if necessary, and make the surfaces match adjacent surfaces.
 - 2. Work uneven surfaces and angles of concrete to a surface matching adjacent concrete surfaces.

3.08 GROUTING AND CEMENT POINTING

- A. After steel columns have been installed and leveled, dry-pack the space between the bottom of the plate and concrete, using cement grout driven in to completely fill the space and forming a solid bearing for the column base plate.

3.09 MISCELLANEOUS CONCRETE ITEMS

- A. Leave openings in floor slabs and future foundations for machines and equipment, where so indicated on the Drawings, and in dimensions and arrangements required for the approved machines and equipment.

END OF SECTION 03300 CAST-IN-PLACE CONCRETE

SECTION 03345

CONCRETE FINISHING

PART 1 GENERAL

1.01 SUMMARY

- A. Provide finishes on cast-in-place concrete as called for on the Drawings, specified herein, and needed for a complete and proper installation.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 03300: Cast-in-place concrete.

1.02 SUBMITTALS

- A. Comply with pertinent provisions of Division 1.
- B. Product data: Within 14 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.03 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Except as may be modified herein or otherwise directed by the Engineer, comply with ACI 301, "Specifications for Structural Concrete for Buildings."

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Comply with pertinent provisions of Division 1.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General:
 - 1. Carefully study the Drawings and these Specifications, and determine the location, extent, and type of required concrete finishes.
 - 2. As required for the Work, provide the following materials, or equals approved in advance by the Engineer.
- B. Concrete materials: Comply with pertinent provisions of Section 03300, except as may be modified herein.
- C. Liquid bonding agent: "Weld-Crete," manufactured by the Larsen Products Corporation.
- D. Curing and protection paper:
 - 1. Approved products:
 - a. "Sisalkraft, Orange Label" by Sisalkraft Division, St. Regis Paper Co.
 - b. 4 or 6 mil. polyethelene.
 - c. Equal products complying with ASTM C171.
 - 2. Where concrete will be exposed and will be subjected to abrasion, such as floor slabs, use non-staining paper such as "Sisalkraft, Seekure 896," or equal paper faced with polyethylene film.
- E. Liquid curing agents:
 - 1. Where application of specified finish materials will be inhibited by use of curing agents, cure the surface by water only; do not use chemical cure.
 - 2. For curing other areas, use products conplying with ASTM C309 in clear finish.
- F. Slip-resistant abrasive aggregate:

1. Provide aluminum oxide, 14/36 grading.
2. Acceptable manufacturers:
 - a. Carborundum Company;
 - b. Norton Company;
 - c. L. M. Scofield Company.

2.02 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 FINISHING OF FORMED SURFACES

A. General:

1. After removal of forms, give the concrete surface one or more of the finishes specified below where so indicated on the Drawings.
2. Revise the finishes as needed to secure the approval of the Engineer.
3. For all patching submit type of material to be used to the Owner for approval.

B. As-cast finish:

1. Rough form finish:
 - a. Leave the surfaces with the texture imparted by forms except patch tie holes and defects.
 - b. Remove fins exceeding 1/4" in height.
2. Smooth form finish:
 - a. Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces, with number of seams kept to a practical minimum and in a uniform and orderly pattern.

- b. Patch tie holes and defects.
 - c. Remove fins completely.
- C. Unspecified finish: If the finish of formed surfaces is not specifically called out elsewhere in the Contract Documents, provide the following finishes as applicable.
 - 1. Rough form finish:
 - a. For all concrete surfaces not exposed to public view.
 - 2. Smooth form finish:
 - a. For all concrete surfaces exposed to public view.

3.03 FINISHING SLABS

- A. Definition of finishing tolerances:
 - 1. "Class A:" True plane within 1/8" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.
 - 2. "Class B:" True plane within 1/4" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.
 - 3. "Class C:" True plane within 1/4" in two feet as determined by a two foot straightedge placed anywhere on the slab in any direction.
- B. Scratched finish: After the concrete has been placed, consolidated, struck off, and leveled to a Class C tolerance, roughen the surface with stiff brushes or rakes before the final set.
- C. Floated finish:
 - 1. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further until ready for floating.
 - 2. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
 - 3. During or after the first floating, check the planeness of the surface with a ten-foot straightedge applied at not less than two different angles.
 - 4. Cut down high spots and fill low spots, and produce a surface with a Class B tolerance throughout.
 - 5. Refloat the slab immediately to a uniform sandy texture.

D. Troweled finish:

1. Provide a floated finish as described above, followed by a power troweling and then a hand troweling.
 - a. Produce initial surface relatively free from defects, but which still may show some trowel marks.
 - b. Provide hand troweling when a ringing sound is produced as the trowel is moved over the surface.
 - c. Thoroughly consolidate surface by hand troweling.
2. Provide a finished surface essentially free from trowel marks, uniform in texture and appearance, and in a plane of Class A tolerance.
 - a. For concrete on metal deck, Class B tolerance is acceptable.
 - b. On surfaces intended to support floor coverings, use grinding or other means as necessary and remove all defects of such magnitude as would show through the floor covering.

E. Broom finish:

1. Provide a floated finish as described above.
2. While the surface is still plastic, provide a textured finish by drawing a fiber bristle broom uniformly over the surface.
3. Unless otherwise directed by the Engineer, provide the texturing in one direction only.
4. Provide "light," "medium," or "coarse" texturing as directed by the Engineer or otherwise called for on the Drawings.

F. Unspecified finish: If the finish of slab surfaces is not specifically called for elsewhere in the Contract Documents, provide the following finishes as applicable:

1. Scratched finish:
 - a. For surfaces scheduled to receive cementitious applications.
2. Floated finish:
 - a. For surfaces intended to receive roofing.
3. Troweled finish:
 - a. For floors intended as walking surfaces;
 - b. Floors scheduled to receive floor coverings of waterproof membrane;

4. Broom finish:
 - a. Medium exterior surfaces.
5. Nonslip finish:
 - a. Exterior platforms, steps, and landings;
 - b. Interior and exterior pedestrian ramps.

3.04 CURING AND PROTECTION

- A. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures, and mechanical injury.
- B. Preservation of moisture:
 1. Unless otherwise directed by the Engineer, apply one of the following procedures to concrete not in contact with forms, immediately after completion of placement and finishing:
 - a. Ponding or continuous sprinkling;
 - b. Application of absorptive mats or fabric kept continuously wet;
 - c. Application of sand kept continuously wet;
 - d. Continuous application of steam (not exceeding 150 degrees F) or mist spray;
 - e. Application of waterproof sheet materials specified in Part 2 of this Section;
 - f. Application of the curing agent specified in Part 2 of this Section or elsewhere in the Contract Documents.
 2. Where forms are exposed to the sun, minimize moisture loss by keeping the forms wet until they can be removed safely.
 3. Cure concrete by preserving moisture as specified above for at least seven days.
- C. Temperature, wind, and humidity:
 1. Cold weather:
 - a. When the mean daily temperature outdoors is less than 40 degrees F, maintain the temperature of the concrete between 50 degrees F and 70 degrees F for the required curing period.
 - b. When necessary, provide proper and adequate heating system capable of maintaining the required heat without injury due to concentration of heat.
 - c. Do not use combustion heaters during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.

2. Hot weather: When necessary, provide wind breaks, fog spraying, shading, sprinkling, ponding, or wet covering with a light colored material, applying as quickly as concrete hardening and finishing operations will allow.
 3. Rate of temperature change: Keep the temperature of the air immediately adjacent to the concrete during and immediately following the curing period as uniform as possible and not exceeding a change of 5 degrees F in any one hour period, or 50 degrees F in any 24 hour period.
- D. Protection from mechanical injury:
1. During the curing period, protect the concrete from damaging mechanical disturbances such as heavy shock, load stresses, and excessive vibration.
 2. Protect finished concrete surfaces from damage from construction equipment, materials, and methods by application of curing procedures, and by rain and running water.
 3. Do not load self-supporting structures in such a way as to overstress the concrete.

PART 4 MEASUREMENT AND PAYMENT (NOT USED)

END OF SECTION 03345 CONCRETE FINISHING

SECTION 04230

CONCRETE MASONRY

303-4 MASONRY CONSTRUCTION

303-4.1 CONCRETE BLOCK MASONRY

1. Portions reprinted through courtesy of Concrete Masonry Association of California.

303-4.1.1 GENERAL

All materials for concrete block masonry shall conform to requirements of 202-2.

303-4.1.2 CONSTRUCTION

All work shall be performed in a workmanlike manner and in full compliance with the applicable building ordinances.

All masonry walls shall be laid true, level, and plumb in accordance with the Plans. Masonry units shall be cured, dry, and surfaces shall be clean when laid in the walls.

During construction, all partially laid walls as well as units in storage shall be protected from moisture. All concrete block units and any partially laid walls which become wet during the construction shall be permitted to dry for at least 1 week or longer, if required by weather conditions, before recommencing work.

Proper masonry units shall be used to provide for all windows, doors, bond beams, lintels, pilasters, etc., with a minimum of unit cutting. Where masonry unit cutting is necessary, all cuts shall be neat and regular and edges exposed in the finished work shall be cut with a power-driven abrasive saw.

Where no bond pattern is shown, the wall shall be laid up in straight uniform courses with regular running bond and alternate header joints in vertical alignment.

Intersecting masonry walls and partitions shall be bonded by the use of 1/4 inch minimum diameter steel ties at 24 inches on centers (maximum).

Where stack bond is indicated on the Plans, approved metal ties shall be provided horizontally at 24 inches on centers (maximum).

Mortar joints shall be straight, clean, and uniform in thickness. Unless otherwise specified or detailed on the Plans, horizontal and vertical joints shall be

approximately 3/8 inch thick with full mortar coverage on the face shells and on the webs surrounding cells to be filled. Units shall be laid with "push joints". No slushing or grouting of a joint will be permitted, nor shall a joint be made by working in mortar after the units have been laid.

Exposed walls shall have joints tooled with a round bar (or V-shaped bar) to produce a dense, slightly concave surface well-bonded to the block at the edges. Tooling shall be done when the mortar is partially set but still sufficiently plastic to bond. All tooling shall be done with a tool which compacts the mortar, pressing the excess mortar out of the joint rather than dragging it out.

If it is necessary to move a block so as to open a joint, the block shall be removed from the wall, cleaned, and set in fresh mortar.

303-4.1.3 PLACING REINFORCING STEEL

Reinforcing steel shall be placed as indicated on the Plans. Splices shall be lapped a minimum of 40 diameters, except that dowels other than column dowels need be lapped only 30 diameters. Column dowels shall lap 50 diameters.

Outside horizontal steel shall lap around corners 40 diameters and be carried through columns unless otherwise shown on the Plans. Inside horizontal steel shall extend as far as possible and bend into corner core. A dowel shall be provided in the foundation for each vertical bar.

Where horizontal courses are to be filled, metal stops shall be used. Use of paper stops will not be permitted. All horizontal reinforcing steel shall be laid in a course of bond beam blocks filled with grout.

Vertical cores containing steel shall be filled solid with grout, and thoroughly rodded.

Where knockout blocks are used, steel shall be erected and wired in place before three courses have been laid. Vertical cores at steel locations shall be filled as construction progresses.

Where knockout blocks are not used, vertical cores at steel locations shall be filled in lifts of not more than 4 feet. The maximum height of pour shall be 8 feet. Cores shall be cleaned of debris and mortar and shall have reinforcing steel held straight and in place. If ordered by the Engineer, inspection and cleanout holes shall be provided at the bottom of each core to be filled.

Reinforcing steel shall be inspected prior to placing grout.

303-4.1.4 PROTECTION AND CURING

During construction operations, all adjoining work shall be protected from mortar droppings. Concrete block masonry shall be protected from the sun and rain. When approved in advance by the Engineer, completed masonry construction may be

protected with a curing compound. Except in hot weather when it may be fog sprayed sufficiently to dampen the surface, finished concrete block masonry shall not be wette

END OF SECTION 04230 CONCRETE MASONRY

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SUMMARY

- A. Work Included: All labor, tools, materials and equipment necessary to install structural steel as shown on the Contract Drawing and hereinafter specified and needed for a complete and proper installation, including but not limited to the following:
 - 1. Connections, anchorages and accessories.
- B. Related Sections:
 - 1. Division 3 Section ""Cast-In-Place Concrete"" for setting of anchor bolts, concrete foundations, and for as-built survey of concrete work.
 - 2. Masonry Work in DIVISION 4.
- C. Products Furnished but Not Installed Under This Section:
 - 1. Anchors for casting into concrete.
 - 2. Anchors for embedding into masonry.

1.02 QUALITY ASSURANCE

- A. Workmanship:
 - 2. Use adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
 - 2. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedures".
- B. Applicable Codes and Regulations:
 - 1. City Building Code

A.I.S.C. Code of Standard Practice for Steel Buildings and Bridges.

Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence:

- 1) "This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any detail configuration of connections developed by the fabricator as part of his preparation of these shop drawings."

Paragraph 4.2.2 is deleted in its entirety.

Paragraph 7.9.3 of the above code is hereby modified by the deletion of the following sentence:

"The contract documents specify the sequence of schedule of placement of such elements."

2. Structural steel members exposed to public view, including trellis framing and exposed roof beams, shall be considered Architecturally Exposed Structural Steel (AESS), and shall be fabricated, delivered and erected per Chapter 10 of the above code.
3. American Welding Society "Code D1-1 Structural Welding Code".

C. Applicable Standards

1. A.I.S.C. Specifications for Design, Fabrication and Erection of Structural Steel for Buildings.
2. R.C.R.B.S.J. Specifications for "Structural Joints Using ASTM A325 Bolts".

D. Qualifications:

1. Fabricator: Company specializing in the fabrication of the work of the Section shall have a minimum 5-year documented experience.
2. Erector: Company specializing in the installation of the work of this Section shall have a minimum 5-year documented experience.

1.03 SUBMITTALS

- A. General: Comply with applicable provisions in Section 01340.
- B. Product Data:

1. Producer's or Manufacturer's Specifications recommended installation instructions, laboratory test reports and other data required to prove compliance with the specified requirements.
 - a. Structural steel, including certified copies of mill test reports covering chemical and physical properties.
 - b. High strength bolts, including nuts and washers.
 - c. Unfinished bolts and nuts.
 - d. Structural steel primer paints.
 2. Shop Drawing including complete details and schedules for fabrication and shop assembly of members.
 - a. Include details of cuts, connections, camber, holes and other pertinent data.
 - b. Indicate welds by AWS symbols, show size, type and length of welds.
 - c. Provide setting drawings, templates and directions for installing anchor bolts and other required anchors.
 - d. Identify details by reference to Sheet and Detail Number on the Contract Drawings.
 - e. Submit erection plan and procedure.
- C. Manufacturer's Mill Certificate: Submittal shall certify that products meet or exceed specified requirements.
- D. Mill Test Reports: Submit manufacturer's certificates indicating structural strength, destructive and non-destructive test analysis.
- E. Welder's Certificate: Submit manufacturer's Certificates certifying welders employed on the work verifying AWS qualifications within the previous 12 months.
- F. Test Reports: Submit reports of tests conducted on shop and field welded and bolted connections, including data on type of tests conducted and test results.
- G. Shop and Field inspection is required.

1.04 FIELD MEASUREMENTS

- A. Verify that field measurements, lines, grades and elevations agree with measurements shown on the Contract Drawings. Concrete Contractor shall furnish the Steel Contractor accurate as-built drawing of bolt settings.
- B. Contractor shall be entirely responsible for the correctness, conformity, accuracy and execution of structural steel work.

1.05 PRODUCT HANDLING

A. Delivery and Storage:

1. Deliver materials, structural steel and components to the job-site properly marked to identify location for which they are intended.
2. Use markings corresponding to markings shown on the approved shop drawings.
3. Store materials in a manner to permit easy access for inspection and identification and to prevent damage, distortion, erosion and deterioration. Keep steel members off ground using approved platforms or other supports.
4. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time not to delay that work.

PART 2 - PRODUCTS

2.01 MATERIALS (AS APPLICABLE)

- A. General: New tested and fabricated stock complying with applicable Standard Specifications hereinafter referenced.
- B. Rolled Wide Flange Sections: ASTM A36 or A992.
- C. Rolled Steel Plates and Bars: ASTM A36.
- D. Steel Pipe: ASTM A53, Type E or S, grade B-welded seamless steel pipe and where applicable API-5L, grade B.
- E. Steel Tubing: ASTM A500, grade B Structural Tubing.
- F. Angles, channels and other miscellaneous shapes: ASTM A36
- G. Anchor Bolts: ASTM A307 or A36, non-headed type with heavy hexagonal nuts unless otherwise indicated on the Drawings.
- H. Unfinished Threaded Fasteners:
 - 1. ASTM A307, Grade A, regular low carbon steel bolts and nuts.
 - 2. Provide either hexagonal or square heads and nuts; except use only hexagonal units for exposed connections.
- I. High Strength Threaded Fasteners: Provide heavy hexagonal structural bolts, heavy hexagonal nuts, and hardened washers, all from quenched and tempered medium carbon steel complying with ASTM A325.
- J. Welding Electrodes: Comply with AWS Code, using AWS A5.1 electrodes.
 - 1. Do not use A5.5 E70XX electrodes.
- K. Touch-Up Primer for Galvanized Surfaces: Zinc rich type.
- L. Shop Paint: Federal Specification TT-P-86a, Type 1, rust inhibitive metal primer; compatible with finish coats as approved by Engineer.
- M. Dry Pack: A cement-sand mix of 1 part Portland Cement to 2-1/2 parts sand by volume with necessary water added to provide for solid compaction.
- N. Galvanizing: ASTM A123 or A153 as applicable.
- O. Galvanizing Repair Material: "Dri-Galv" or "Galvicon" or equal approved

90% zinc rich cold process repair material.

- P. Primer: Use "10-99 Tremec Primer", "Rustoleum No. 5769 Primer" or approved equal.
- Q. Non-Shrink Grout: An approved non-shrinking premixed material; "Por-Rok" by Hallemite Mfg. Company or "Embeco" by Master Builders or equal.

PART 3 – EXECUTION

3.01. GENERAL

- A. Workmanship: In accordance with A.I.S.C. Code of Standard Practice and best trade practices.

3.02. Shop Fabrication and Assembly:

- A. Fabricate items of structural steel in accordance with AISC specifications, and as indicated on the approved Shop Drawings.
- B. Fabricate architecturally exposed structural steel with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of standards Practice for steel Buildings and Bridges" for architecturally exposed structural steel.
- C. Properly mark and match-mark materials for field assembly and for identification as to location for which intended.
- D. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
- E. Where finishing is required, complete the assembly, including welding of units, before start of finishing operations.
- F. Provide finish surfaces of members exposed in the final structure free from markings, burrs, and other defects.
- G. Joints and intersections to be accurately made, tightly fitted, true to plane and accurately fastened.
- H. Provide bearing plates, connection stiffeners and gussets as necessary for the work indicated on the Drawings whether detailed or not.

3.03. Connections:

- A. Methods: Bolted or welded as indicated on the Drawings.
- B. Provide bolts and washers of types and sizes required for completion of field erection.
- C. High strength bolted construction:
 - 1. Install high strength threaded fasteners in accordance with AISC "Specifications for Structural Joints Using ASTM A325 or A490 Bolts."
 - 2. Use A325SC bolts unless noted otherwise.
- D. Welded construction: Comply with AWS Code for procedures, appearance, and quality of welds.
 - 1. Shop and field welding to be done by a licensed fabricator.
 - 2. Repair welds by methods as provided for in Article 410 of the AWS Specifications D1.0 Costs of repairs to be borne by the Contractor.
- E. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.
- F. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.
- G. Contractor shall submit erection methods including details for temporary setting of bolts, etc.

3.04 Holes for Other Work:

- A. Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on the approved Shop Drawings.
- B. Provide threaded nuts welded to framing, and other specialty items as shown, to receive other work.
- C. Cut, drill, or punch holes perpendicular to metal surfaces.
- D. Do not flame cut holes or enlarge holes by burning.
- E. Drill holes in bearing plates.

3.05 SHOP PAINTING

A. General:

1. Shop paint structural steel work, except those members or portions of members to be embedded in concrete or mortar or which are scheduled to receive sprayed-on-fireproofing.
2. Paint embedded steel which is partially exposed on the exposed portions, and the initial 2" of embedded areas only.
3. Do not paint surfaces which are to be welded or high-strength bolted with friction type connections.
4. Apply two coats of paint to surfaces which are inaccessible after assembly or erection. Change color of the second coat to distinguish it from the first.

B. Surface Preparation:

1. After inspection and before shipping, clean steelwork to be painted.
2. Remove loose rust, loose mill scale, and spatter, slag, and flux deposits.
3. Clean steel in accordance with Steel Structures Painting Council SP-3, "Power Tool Cleaning".

C. Painting:

1. Immediately after surface preparation, apply structural steel primer paint in accordance with the manufacturer's recommendations and at a rate to provide a uniform dry film thickness of not less than 1.5 mils.
2. Use painting methods which will result in full coverage of joints, corners, edges, and exposed surfaces.

- D. Hot Dip Galvanize structural steel members which are exposed to weather conforming to ASTM A123. Provide minimum 1.25 oz/sq.ft. galvanized coating.

3.06 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until detrimental conditions are corrected.
- B. Properly mark or match materials for field assembly and for identification as to locations for which intended.

- C. Provide finished surfaces of structural steel members installed free from marks, burrs or other defects.

3.07 ERECTION

- A. Comply with AISC Specifications and "Code of Standard Practice", except as may be modified herein.
 - 1. Contractor shall schedule and coordinate work of this Section with Related Work specified elsewhere to produce a workmanlike installation and not delay completion of contracted work.
- B. Anchor Bolts:
 - 1. Provide as indicated on the Drawings; Anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
 - 2. Provide steel templates and other devices necessary for presetting bolts and anchors to accurate locations in concrete or masonry construction.
- C. Bases and Bearing Plates: Shop weld to columns and members attached to concrete.
- D. Setting Bases and Bearing Plates:
 - 1. Clean concrete bearing surfaces free from bond-reducing materials, and then roughen to improve bond to the surface.
 - 2. Clean the bottom surface of base and bearing plates.
 - 3. Set loose and attached base plates and bearing plates for structural members in wedges or other adjusting devices.
 - 4. Tighten anchor bolts after the supported members have been positioned and plumbed.
 - 5. Do not remove wedges or shims but, if protruding, cut off flush with the edge of the base or bearing plate prior to assure that no voids remain.
 - 6. Pack grout solidly between bearing surfaces and bases or plates to assure that no voids remain.
 - 7. Finish exposed surfaces, protect installed materials, and allow to cure in strict compliance with the manufacturers' recommendations.

8. Apply grout in accordance with manufacturer's instructions. Grout shall have a compressive strength of not less than 3000 psi in 7 days.
- E. Splicing:
1. Splice members only where indicated unless, with the Engineer's approval, splices not indicated would result in lower costs due to reduced shipping expense.
 2. For splices not indicated, submit structural calculations prepared and signed by a Structural Engineer licensed to practice where the project is located.
- F. Gas Cutting:
1. Do not use gas cutting torches for correcting fabricating errors in the structural framing.
 2. Cutting will be permitted only in secondary members as acceptable to the Engineer.
 3. When gas cutting is permitted, finish the gas cut section to a sheared appearance.
- G. Surveys:
1. Establish permanent benchmarks necessary for accurate erection of structural steel.
 2. Check elevations of concrete surfaces, and locations of anchor bolts and similar items, before erection proceeds.
- H. Temporary Shoring and Bracing:
1. Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads.
 2. Provide temporary guy lines to achieve proper alignments of the structure as erection proceeds.
 2. Remove temporary connections and members when permanent members are in place and the final connections have been made.
- I. Field Assembly:
1. Set structural frames accurately to the lines and elevations indicated.

2. Align and adjust members forming part of a complete frame or structure before fastening permanently.
3. Clean the bearing surface, and other surface which will be in permanent contact, before assembly.
4. Adjust as required to compensate for discrepancies in elevation and alignment.
5. Level and plumb individual members of the structure within specified AISC tolerances.
6. Establish required leveling and plumbing measurements on the mean operating temperature of the structure, making allowances for the difference between temperature at time of erection and the mean temperature at which the structure will be when completed and in service.
7. Comply with AISC specifications for bearing, adequacy of temporary connections, alignment, and the removal of paint on surfaces adjacent to welds.

3.08 TESTING AND INSPECTING

A. Identification and Tests:

1. The Owner shall select and employ a testing laboratory which will procure specimens and make required tests. Cost of procuring test specimens at a location more than 50 miles from the jobsite will be paid by the Owner and backcharged to the Contractor.
2. Costs of tests of identified stock will be paid by the Owner, except that if a test fails to comply with specified requirements, the cost of testing will be backcharged to the Contractor.
3. Cost of tests of unidentified stock will be paid by the Owner and backcharged to the Contractor.
4. If structural steel can be identified by heat or melt numbers, and is accompanied by mill analysis and test reports, not less than one tension and one bend test will be made for each ten tons or fractional part thereof.
5. If structural steel cannot be identified, or if its source is Questionable, not less than one tension test and one bend test will be made for each five tons or fractional part thereof.
6. If steel pipe can be identified by heat or melt numbers, or

manufacturer's name, not less than one tension test and one bend test will be made for each ten tons or fractional part thereof.

B. Inspecting:

1. Cost of visual inspection will be paid by the Owner, except as noted below. The inspections shall be by a Testing Agency employed and selected by the Owner.
2. If, after fabrication and inspection, the work of this Section is found to be defective and to require reinspection, cost of such reinspection will be paid by the Owner and backcharged to the Contractor.
3. Provide labor, equipment, and facilities needed to move and handle the materials to be inspected.

C. Welding Inspection:

1. Unless otherwise specified, perform welding under observation of a qualified inspector from a testing laboratory employed and selected by the Owner.
2. Inspect every layer of weld for quality, penetration, and conformity with design requirements.
3. Require the welding inspector to submit a signed report to the Construction Manager, verifying that:
 - a. The welding is adequate and was performed in conformity with the specified requirements; and
 - b. Adequate methods have been used to determine the quality of the welding.
4. The welding inspector may use gamma ray, magnaflux, trepanning (to drill a hole), or any other aid to visual inspection considered necessary to assure adequacy of welding, or may use ultrasonic testing performed in accordance with pertinent requirements of governmental agencies having jurisdiction.

D. Access: Provide access for the testing agencies and inspectors to places where structural steel work is being fabricated or produced, so that required testing and inspecting may be accomplished.

E. Erection Inspecting:

1. The testing agency will conduct and interpret the tests, and will state in each report whether the inspected work complies with the

requirements, specifically stating all deviations therefrom.

- F. Corrections:
1. Correct deficiencies in structural steel work which inspections and test reports indicate to be not in compliance with the specified requirements.
 2. Perform additional tests required to reconfirm noncompliance of the original work and to show compliance of corrected work, all at no additional cost to the Owner.

3.09 FIELD PAINTING

- A. General:
1. Prepare surfaces in a manner appropriate to the condition in accordance with manufacturer's recommendations.
 2. Clean spots and surfaces where primer coats have been removed, damaged, or burned off, and clean field bolts and other field connections not concealed in the finished work.
 3. Remove dirt, oil, and grease.
 4. Apply a spot coat of the approved primer.
 5. Do not apply paint to wet, damp, oily, or improperly prepared surfaces.
- B. Notify the Owner when the work of this Section is ready to receive field painting.
1. Secure inspection and approval prior to field painting.
 2. Using spray or brush, as recommended by the manufacturer of the approved paint material, fill all joints and corners and cover the surfaces with a smooth unbroken film of at least 1.5 dry mils thickness.
 3. Apply two coats to all surfaces of steel which will be inaccessible for painting, after fabrication and erection.

3.10 FIELD GALVANIZING

- A. Required: For protective coating of damaged galvanized surfaces resulting from welding or other construction operations in the field or at the job-site.
- B. Method: By "Dri-Galv" or "Galvicon" or equal method in accordance with manufacturer's directions, hereinbefore specified in Subsection 2.1(m).

END OF SECTION 05120 STRUCTURAL STEEL

SECTION 10 70 00

PREFABRICATED RESTROOM BUILDING

A. General, Specifications and Clarification of Prefabricated Building and Site Installation

1. This portion of the bid specifications does not follow the CSI standard format as the prefabricated structure in this bid is an **off-site constructed "product"** and not "typical" general construction.
2. The **installation of the product on-site is general construction** which must be coordinated between the Owner or their general contractor and the supplier. Specifications for the building foundation/pad shall be provided herein by the specified design/build supplier. Due to the responsibility of the specified building supplier for architecture, engineering and a five-year warranty, the site pad/foundation must meet the suppliers design so the pad and building can be considered from a single source for warranty purposes. The supplier must accept the pad and compactions tests before they take responsibility for the entire system under their warranty.

B. Architectural Design/Engineering and Insurance Responsibility

1. While the Owner has provided bid specifications and a design for the building, the building design/build supplier remains legally responsible for architecture, engineering, and all applicable building, safety, health, fire, and accessibility code compliance. Since they hold professional design responsibility to the owner, the building supplier must furnish certification that they provide product liability insurance in the amounts required by the general specifications **to cover property damage and personal injury**. Final drawings shall be stamped by a California engineer and California Department of Housing and Community Development, suitable for local permitting.

C. Errors and Omissions Insurance

1. The building design/build supplier must also provide an additional Professional Architectural and Engineering Errors and Omissions insurance, in the minimum amount of \$2,000,000, **to cover claims against the owner or their general contractor for State and Federal ADA handicapped accessibility and other design/engineering code issues**. This Errors and Omission Policy must remain in effect for 5 years from the completion and owner acceptance of the project. Products liability insurance (since it does not cover professional design responsibility only) will be insufficient for this bid and will be cause for rejection of the bidder.

D. Insurance for the Building offsite, while in transit, and/or on site until turn over and final owner acceptance

1. The supplier may request invoicing for a percentage of building completion in-plant, monthly. Under UCC law, this means that the supplier is turning over responsibility for the portion invoiced to the Owner yet the building will not be on the owner's property and may not be covered by the owners insurance. Therefore, the building supplier must provide a separate insurance policy insuring the owner and their general contractor as additionally insured for liability, damage and/or vandalism to the building while in the manufacturing facility, while in transit, and/or while in storage at a certified bonded storage facility or at the final project site for up to \$200,000 for each prefabricated building module, until the building is final accepted by owner.

E. Owner or General Contractor Coordination with Design/Build Supplier

1. The specified prefabricated public restroom building requires coordination between the Owner or their general contractor (who prepares the site pad and delivery access for the prefabricated storage building) and the prefabricated restroom building supplier (who completes the architectural design, engineering, off-site building construction, delivery and installation on site.) The specified prefabricated restroom building specifications include unique components/systems which are custom to the restroom building supplier. Since the restroom supplier is responsible for design, additional insurance requirements for errors and omissions is required.

F. Owner or General Contractor, General Scope of Work

1. The Owner or their general contractor for this project is responsible for the site survey and staking the building location, finished slab survey elevations and marking on site, construction and compaction of the required building pad; access to the site for a large crane and tractor trailers delivering the prefabricated building; providing water, sewer, and power at a point of connection (POC) within 6 feet of the building and at the depth required by the building subcontractor and local code; and the installation of any sidewalks outside the building footprint.
2. The Owner or their general contractor is responsible for verification to the building subcontractor design/build firm that there are no unanticipated site delivery issues such as overhead wires, trees, tree roots, or existing grade changes and that prevent a clear path of travel between a roadway and the final site exists for a tractor trailer and crane to expedite delivery. The design/build supplier requires that the owner or their general contractor certify that the required delivery crane must be able to set the building module/modules within 35' distance from the center of the building to the center of the crane hoist.

G. Supplier/Prefabricated Restroom Building, General Scope of Work

1. The prefabricated restroom building specialist will provide to the Owner or their general contractor final building design architectural drawings and engineering calculations under the responsibility of a licensed structural engineer, in compliance with all local, state and federal codes. The design/build supplier shall

construct the building offsite as a permanently relocatable building, transport it to the final required destination, and install the building turnkey, (to 6' from the building footprint) on an Owner or general contractor prepared pad per the drawings included in this bid.

H. Licensing:

The supplier must comply with all the State of California; Department of Housing and Community Development, prefabricated "Commercial Modular Requirements" as follows:

1. The building *manufacturer* must be licensed by the State of California, Department of Housing and Community Development as a manufacturer.
2. The selling dealer (if applicable) must be a California licensed dealer and present their license for verification with the bid.

The licensed dealer must also possess a State of California Contractors License Board Class B License and present their license for verification with the bid.

I. Bid Standard for the Prefabricated Restroom Building

1. The Owner understands that there are several firms who design and build various types of pre-fabricated public restroom buildings in varying quality and architectural styles, using similar or different construction methods and materials. For the purpose of this project, the Owner has selected:

Public Restroom Company, 2587 Business Parkway, Minden, Nevada, 89423 and specifies herein that this firm is the standard for architectural design, safety, green design, code compliance, and site specific compatibility. Public Restroom Company is the standard of building performance and quality for the 50-year building design-life with low maintenance based upon the longevity of the materials selected.

Contact: **Chris Gaughan**, Regional Sales Manager

Phone: **888-888-2060 extension 106**

Fax: **888-888-1448**

Email: **ChrisG@PublicRestroomCompany.com**

Web: **www.publicrestroomcompany.com**

J. "Or Equal Restroom Design/Build Suppliers"

1. The Owner may also allow other firms to become qualified to bid but any firms so authorized to bid must comply with the bid specifications and plans, or be subject to post bid rejection.
2. In order to provide full and open competition, other firms may request approval as "or equal." **The following items must be provided to the Owner in accordance with substitution requirements outlined in the project specifications.** Failure

to supply these items will result in bid rejection.

- a) Or Equal applicant shall provide with their bid submission, scaled floor plans and elevations, to show general architectural design criteria is met.
 - b) Or Equal applicant shall provide with their bid submission, a written list of each and every deviation from the published bid specifications/plans. Lack of specificity to each deviation from the bid specifications will be cause for rejection.
 - c) Or Equal applicant shall provide with their bid submission, manufacturer's certification of test compliance from a national independent testing laboratory to support the claim for absorption resistance of the slab type that will be used in their proposed restroom. Or Equal applicant must provide a list of every building they designed and built over the last 3 years utilizing the same building materials/systems design criteria as published in this bid. Provide date of building bid, date of completion, and most knowledgeable owner contact.
 - d) Or equal applicant shall provide certification of the special insurance required in this bid.
 - e) Or Equal applicant shall be responsible for and bear all cost for architecture, plan checks, design and structural engineering and all fees in obtaining approvals and permits from applicable agencies.
3. Precast Concrete Structures will not be accepted.
 4. The Owner or their consultant will be solely responsible for the decision to accept or reject the "or equal" submission.

K. Certificate of Off-site Inspection and Construction Compliance, Provision for Maintenance Manuals, and Warranty

1. The off-site restroom construction requires that a licensed third party inspection firm provide the Owner and the local building official with certification and compliance for the building with the approved plans and specifications. A certificate of compliance shall be issued by this inspector to the local building official to provide certification that the building meets and or exceeds the approve plans and applicable codes.
2. At the project conclusion, the building supplier shall furnish two sets of complete maintenance manuals including a trouble shooting guide, location of manufacturers of key components for replacement parts together with final as-built plans, and a **five (5) year warranty** to the owner or general contractor.

L. Site Scope of Work by Owner or Their General Contractor

The Owner or general contractor shall prepare the restroom building sub grade pad to receive the prefabricated building in accordance with the bid drawings.

1. The building pad shall be excavated to 14" deep from the final building concrete slab elevation in accordance with the drawing titled "foundation pad design."

2. The building pad shall meet a 90% compaction in lifts using class II base for the first four inches and coarse sand for the last two inches of the pad, leaving the finished sub grade pad elevation at finished floor, minus 8”.
3. The Owner or general contractor shall provide water point of service at 30” below finished building slab; sewer at 24” below the finished building slab; and electrical at 36” below the finished building slab or other per bid plans.
4. Owner or their general contractor shall coordinate with restroom supplier to provide full site delivery access for a 70’ tractor-trailer and hydro crane to the final building site.
5. If the final site access is over existing sidewalks, utilities, or landscaping, the Owner or their general contractor shall be responsible for plating and or tree trimming, utility line removal, or other to protect any existing conditions.
6. The hydro crane must be able to locate no greater than 35’ from the center point of the building to the center point of the crane.
7. The utilities shall be furnished per bid site plans at specified points of connection (POC) nominally 6’ from the building line.
8. Owner or their general contractor shall furnish and install final grading, landscaping and sidewalks.

M. Connection to Utilities

1. The restroom subcontractor will furnish Electrical, Water, and Sewer at the proper POINT OF CONNECTION AND AT THE PROPER ELEVATION BELOW GRADE, for this project. Restroom subcontractor shall provide final hook up of the water from building to POC; sewer hookup to POC; and electrical sleeve from building panel to POC only. Final utility connections shall be by owner, their general contractor, or others. Owner or their general contractor shall flush the water lines thoroughly before making final water connection to the building.

N. Concrete Slab, Required Independent Testing Laboratory Certification

1. The prefabricated building slab special concrete technology claims to be water and urine resistant for life due to special additive technology. The building subcontractor must furnish a test certification of compliance from a national independent testing laboratory to support the claim for absorption resistance. The written report must state the concrete compressive and absorption per ASTM standard #C642 and #C39 respectively. Since this non-absorbency capability is so significant, the design/build subcontractor must provide a general certification of compliance with the above standards.

O. Prefabricated Restroom Building

1. The Owner has evaluated several prefabricated restroom building suppliers. This bid requires such a building be used in lieu of site built traditional construction because of the unique built-in advantages guaranteed by the design/build firm. This technology includes many new innovations such as non-absorbent concrete; anti-microbial components to reduce health risks; built in vandal resistance design; lowered maintenance and long-term warranties that reduce owner risk for failure.

The specifications below are written around this new technology.

P. Mat Engineered Concrete Building Slab/Foundation

1. The mat engineered 8" thick slab/foundation shall be engineered and constructed to withstand the transportation weight of the building without cracking and to resist absorption from any liquids deposited on the surface. The concrete slab shall be constructed inside a steel angle curb, reinforced with dual mats (tension and compression,) and poured with a custom concrete formula with special admixtures to create a finished slab that is water-proof for life.
2. Perimeter Steel Curb: 5/16" 50,000 kip steel 6" X 6" welded continuous angle.
3. Rebar Steel Mat: Two layers of 40,000 tensile steel rebar in varying sizes per engineers requirements, including a perimeter structural continuous grade beam design inside the exterior steel angle and at any other location deemed by the engineer of record as required for the use intended. In coastal locations or when required for corrosion resistance rebar shall be epoxy coated or fiberglass to resist permanent corrosion. Rebar mats shall be wire tied to code with a minimum of three turns of the wire and overlaps shall be minimum of 15 diameters for any connection.
4. All slab openings shall be surrounded with two layers of steel collars as required by the engineer of record to stop corner cracking and to reinforce the openings for lifting.
5. 1" thick by 3" minimum length threaded nuts shall be welded to the steel perimeter frame with continuous 1/4" fillet welds. Nuts shall be welded to common steel plates per the engineer of records design and attached to the interior steel rebar structural mats.
6. The engineer of record shall provide lifting locations with sufficient reinforcement to allow the safe lifting of the entire designed weight of the structure with dual 1" steel bolts and washers at each lifting location. The number of lifting locations with each location fitted with removable 3/4" 8" X 8" 50,000 tensile strength steel angles shall be determined by the engineer of record.
7. The slab shall be poured over a 1" thick steel plate table. The concrete mix design shall not exceed a 3" slump and shall be stinger vibrated for maximum consolidation. All floors shall slope to any floor drains within each room and if no floor drain is present the floor should not slope. The surface shall be a very light broom that should meet a coefficient of friction on the surface of .06. Birdbaths shall be cause for rejection.
8. The steel perimeter angle will remain below the concrete surface by nominal two inches to prevent corrosion. After the site concrete sidewalks are poured, the joint shall be full flow sealed with self-leveling grey urethane caulk to prevent penetration of water into the joint.
9. The building shall be designed for future relocation and shall provide protection for the lifting openings in the mat slab so that the threaded openings will be available for future use if needed.
10. The building system shall be designed for placement on an owner or their general contractor site prepared class 2 building pad/and or footings as required by code, per the bid drawings, suitable for 1500 pounds soil bearing capacity minimum. Any

soils survey (if necessary) shall be by owner or engineer of record.

Q. Exterior & Interior Masonry Block Walls

1. The exterior walls shall be 4" thickness per State of California codes or engineering for wind and seismic. The interior walls shall be 4" block to ceiling height.
2. The 8" mat engineered concrete slab shall be cured a minimum of 7 days. Holes for vertical dowels shall be drilled into the mat engineered slab avoiding any grade beams or other structural reinforcement. Once the holes are drilled, blow out the remaining material and using two part structural epoxy, wet set the #3 or #4 vertical rebar (as specified on the engineering calculations into holes drilled to the depth per the engineer of record requirements. Each rebar shall be held vertical to allow equal epoxy support to each dowel during the drying period. Engineering calculations require that rebar shall be installed in each concrete block center void or every block hole. The engineered uplift on each rebar shall be sufficient to restrain any load imposed on the masonry block wall for vertical rebar pull out from the concrete mat engineered slab.
3. The block walls shall be nominal 8" x 16" CMU. The building corners shall have special corner return block that matches the exterior finish and creates a uniform appearance. All 4" CMU shall be custom fabricated with an enlarged interior hole for placement of the grout and vertical rebar.

R. Roof System

1. The roof structure shall be 2" x 6" wood rafters at 24" on center with 5/8" OSB sheathing, and ice and water shield membrane with 26-gauge Decra-Villa metal tile, color selected by owner. The rake and fascia shall be 14 gauge formed steel painted in a color selected by owner. The rake and fascia shall be 14 gauge formed steel painted in a color selected by Owner.
2. Roof shall be designed per plans to reduce vandals climbing on roof and to obtain proper ventilation size openings for the gables to provide fan-free ventilation.
3. The restroom ventilation screens (described in a following section) shall be attached to the truss frames and non-removable by vandals. Roof color shall be determined by owner.

S. Interior Wall Finish

1. Interior precision CMU block masonry walls shall be smoothed to a pebble grain finish with 2-4 mil layers of 7-day curing block fillers and painted with two additional 4 mil layers of industrial high solids (white) industrial grade enamel.

T. Exterior Wall Finish, Masonry and Gable

1. The building exterior finish shall be of split face 8" x 16" CMU to wall height, per the exterior elevations in the bid plans. The block shall be coated with 2-4 mil layers of special 7-day curing block fillers and painted with two additional layers of industrial high solids, gloss enamel to a 4 mil thickness. Color to be selected by Owner.

U. Gable Ventilation System

1. Shall be woven ¼" X 1" X 1", 316T, stainless steel woven crimp-stop wire mesh set into grooved channels within the CMU block with a stainless steel channel at the connection to roof structure.

V. Doors and Gates

1. The restroom entry doors shall be 7'-0" high, custom fabricated, 14 gauge steel; reinforced with 14 gauge steel ribs welded at 6" intervals on each face, concealed; reinforced with a welded plate for door closer mounting; hung on a single continuous, 1 million cycle, aluminum gear hinge with stainless steel vandal resistant screws at nominal 4" on center. The doors shall weigh nominally 176 lbs each for a 36" X 84" door. Custom fabricated 14-gauge steel door jambs with 4" steel heads shall be welded to the steel cap beam and be solid filled with 3000 psi masonry grout mix.
2. Doors shall be undercut per drawings
3. All entry doors shall have a 1/8" thick plate stainless steel "Z-shaped" anti-microbial pull handles with integral latch guard (latch guard on concession entry door and utility chase door only) and Schlage B-600 series commercial series dead bolts.
4. The door closer (restroom entry doors only) shall be "LCN" heavy duty #4210 Series, fastened to a structural reinforced door plate per door manufacturer design. Stainless steel vandal resistant fasteners shall be used on all hardware.
5. Stainless steel vandal resistant fasteners shall be used on all hardware.

W. Specialties

All specialty washroom equipment shall be commercial grade stainless steel fastened securely to walls with vandal resistant stainless steel screws to avoid removal by vandals as follows:

1. Toilet paper holder shall be a covered two-roll, 18-gauge stainless steel. Toilet paper holders shall be attached to block walls with 4 epoxy bedded vandal resistant stainless steel fasteners.
2. Stainless steel grab bars to code shall be 1 ¼" minimum exposed fastener vandal resistant design and installed at each accessible water closet.
3. Cast Aluminum ADA compliant signs shall be recessed into block surface flush with masonry exterior. Signs shall have raised pointed Braille tips and shall be blind secured with epoxy adhesive and stainless steel fasteners.
4. Baby Changing Stations shall be the Foundations Horizontal Surface Mount
5. Hand Dryer: Dyson Airblade V, nickel finish, mounted adjacent to lavatories
6. Soap Dispenser shall be a stainless steel thru wall nozzle with remote reservoir located in the mechanical chase.

X. Plumbing

1. Building shall be fully compliant with the following codes:
 - a) All applicable State of California Building Codes. Latest edition applicable.
 - b) California Plumbing Code. Latest edition applicable.

2. GENERAL: All components and fabrications shall be designed to reduce life cycle maintenance, be compatible with current maintenance spare parts, and shall be listed in a spare parts/maintenance manual (two copies) delivered in utility chase of building.
3. WATER PIPING: Shall be type L copper above grade and type K with silver solder below grade. All water piping shall be designed and constructed with high and low point drain fittings. All piping shall be mounted on Uni-strut wall brackets with neoprene isolators, to code.
4. WATER PRESSURE GAUGE/VALVE COMBO: install three commercial grade industrial water pressure gauges, isolation ball valves, 10 micron water filter with clear canister and check valve.
5. PLUMBING FAUCETS, ISOLATION VALVES AND ACTUATORS: All fixtures except those with flush valves shall be isolated with ball valves for each fixture, concealed hydraulic button-type flush valves, and metered push-button type lavatory faucets.
6. DWV PIPING: DWV piping shall be concealed behind the wall. DWV piping shall be PVC DWV, solvent welded, for all concealed piping. A cast iron no hub DWV vent pipe with a cast iron roof mounted vandal cap vent shall be required, through the roof.
7. REMOVABLE PIPE TRAPS: All floor drain, sink drain, and waste traps shall be removable for maintenance. Floor drains shall be trapped behind the wall in the utility chase using a combination waste and vent system. Floor drains shall be increased two pipe sizes over standard to allow code use. All surface mounted utility chase piping shall be mounted on Uni-strut with plastic isolators to code. Sink drain traps shall be concealed behind the utility chase walls where maintenance staff can access all plumbing.
8. PLUMBING FIXTURES: Plumbing fixtures shall be 14-gauge 316 stainless steel manufactured by Acorn. Toilets shall be wall hung, rear discharge, with concealed lever flush valves. Toilet seats shall be black solid core plastic, non-flammable construction with continuous stainless steel concealed self-checking hinges. Lavatories shall have concealed remote traps behind the mechanical wall. Schedule of fixtures:
 - a. Water Closets: Acorn Penal-Ware, 1675-W-1-HET-FVBO-ADA-PFS
 - b. Water Closet Flush Valve: Zurn Z6143AV-HET-BG-7L
 - c. Lavatories: Acorn Penal-ware 1652LRB-1-DMS-03-M
9. FLOOR GRATES: Removable 350 lbs per square foot pultruded fiberglass non-skid floor grates shall be installed over every opening in the utility chase for OSHA protection/compliance.
10. HOSE BIB: There shall be one Woodford 24-P hose bib provided in the utility chase.
11. HOSE REEL: One commercial grade hose reel with capacity for 75' X 3/4" commercial heavy-duty hose and nozzle shall be hung in mechanical room for cleaning of restrooms. One 75' x 3/4" commercial hose shall be furnished.

Y. Electrical

1. GENERAL: Electrical system and components shall be commercial grade or better

and piping conduits shall be installed on commercial Uni-strut wall hangers. Interior and exterior electrical lighting fixtures in public areas shall provide lifetime manufacturer's warranty.

2. **PANEL/WIRING:** One 100-amp, three phase main industrial grade Panel Board, Square "D" QO series, shall be mounted in the utility chase in the restroom building. All breakers shall be plug-on type, minimum 10,000 A.I.C. RMS (Sym) at 120/240 vac. Wiring shall be stranded copper wire #12 min in EMT piping with screw fittings.
3. **PIPING:** All piping shall be surface mounted to the masonry block walls with minimum of 2" fastener penetration. EMT conduit shall be compression type. Main panel shall maintain a 30" X 36" safety code required clear space, floor to 6' above finished floor.
4. **EXTERIOR LIGHTING:** Luminaire YWP610, LED, vandal resistant, high-impact polycarbonate lens fixtures shall be installed per plans
5. **INTERIOR LIGHTING:** Luminaire SWP1212, LED, vandal resistant high-impact polycarbonate lens fixtures shall be installed in the restrooms per plans The utility chase shall have one (1), 4' single-tube LED fixture, suitable for wet locations, with a single switch at door entry.
6. **LIGHTING CONTROL:** All exterior restroom lighting shall be controlled by a photo cell mounted 8' high on the utility chase/restroom wall. Two (2) bypass switches shall be located in the utility chase (one for interior lighting and one for exterior lighting), so maintenance staff can check operation during daylight hours. Integral occupancy sensors shall control the interior lighting.
7. **ELECTRICAL OUTLETS:** (1) commercial spec grade dedicated GFCI in the utility chase.
8. **WATER HEATER (Restroom Lavatories):** Shall be a Stiebel DHC-E-3 tankless located in the utility chase

Z. Shipping Protection

The building, while traveling over roads to the destination may encounter inclement weather or road grime that could require substantial cleaning when it arrives on site. The building shall be shrink-wrapped before transportation and sufficiently strong to arrive at the owner site intact for exterior finish protection. Materials removed on site shall be disposed of and recycled by restroom building install staff.

AA. Certifications

Building shall be certified in compliance with the plan approval by the State of California, Department of Housing and Community Development and shall be delivered with an applied insignia in compliance with all State regulations. The local building authority shall provide site inspections for the underground mechanical piping and final connections, footings, and access issues outside the restroom footprint. Restroom building subcontractor shall also furnish 5 year warranty, certifications for the concrete slab specification compliance, and maintenance manuals for the building and components.

END OF SECTION 10 70 00
PREFABRICATED RESTROOM BUILDING

DIVISION 10 73 00

PROTECTIVE COVERS

PART 1 - GENERAL

1.01 DESCRIPTION OF PRODUCT

- A. Shelter Type: 14' x 28' Barrel Vault Cantilever Style Shelter with Curved Mega-Rib roof panels.
- B. Clear height under Tie Beam (UTB): 8'-0". This is the clearance under the tie beam which spans between the columns.

1.02 REFERENCES

A. REFERENCED STANDARDS

- 1. AISC – American Institute of Steel Construction
 - a. AISC Steel Construction Manual – 14th edition
 - b. AISC 360-10 Specification for Structural Steel Buildings
- 2. ASTM – American Society for Testing and Materials
 - a. ASTM A36/A36M – Standard Specification for Carbon Structural Steel; 2008
 - b. ASTM A325 – Standard Specification for Structural Steel Bolts, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010
 - c. ASTM A563 – Standard Specification for Carbon and Alloy Steel Nuts; 2007a
 - d. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a
 - e. ASTM A653/A653M – Standard Specification for Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvanealed) by the Hot Dip Process; 2010
 - f. ASTM A792/A792M – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process; 2010
 - g. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 50 and 105 ksi Yield Strength; 2007a
- 3. AWS – American Welding Society
 - a. D1.1
 - b. D1.3
 - c. D1.8
- 4. OSHA – Occupational Safety and Health Administration
 - a. Steel Erection Standard 29 CFR 1926.750 Part R
- 5. SSPC – Steel Structures Painting Council
 - a. SSPC-SP 2 – Hand Tool Cleaning; 2004

- b. SSPC-SP 10/NACE No. 2 – Near White Blast Cleaning; 2007
- 6. LEED – Leadership in Energy and Environmental Design
- 7. ISO – International Organization for Standardization

1.03 SYSTEM DESCRIPTION

- A. The structure shall be a pre-engineered package and shall be shipped as a pre-cut (excluding standing seam roof panels) and pre-fabricated package that shall include the structural framing members, roof panels, fasteners and roof trim as well as job specific installation instructions. The structure will be shipped in an un-assembled package for ease of shipment and minimum shipping charges.

1.04 SUBMITTALS

- A. Submit a minimum of four (4) sets of submittal drawings and (2) sets of structural calculations signed and sealed by a Professional Engineer licensed in the State of California.

B. PRODUCT DESIGN REQUIREMENTS:

- 1. The structure shall meet the following design requirements
 - a. Building Code: 2016 California Building Code
 - b. Ground Snow Load: 20 p.s.f.
 - c. Live Load: 20 p.s.f.
 - d. Wind Speed: 85 m.p.h. Exp “C”
 - e. Seismic Design Category: D

C. SUBMITTAL REQUIREMENTS

- 1. Calculations:
 - a. Design according to the requirements of the national, state or local building codes as indicated in Section 1.04.B.
 - b. Calculations shall include all member design for each different member type.
 - c. Connection design for each different connection that will determine the design of the bolts, welds, plate thickness and anchorage to the foundation.
 - d. Foundation design shall be for the loads applied and not a generic foundation design, taking into account all soils information.
- 2. Submittal Drawings:
 - a. Anchor bolt layout with all appropriate dimensions for installation.
 - b. Site specific foundation design.
 - c. Isometric as well as elevation and plan views of the framing members along with the member sizes and locations indicated on the drawings.
 - d. Connection details for every connection on the frame.
 - e. Roof panel connections and trim installation details.

- f. All accessories on the structure shall have an installation detail as well as connection details.

D. FOUNDATION DESIGN

1. The foundation design shall be as shown on the drawings.
2. Anchor bolts shall be supplied by the manufacturer.
3. Foundation materials and labor shall be provided by the structure contractor.

1.05 QUALITY ASSURANCE

A. MANUFACTURER QUALIFICATIONS

1. The product shall be designed, engineered and fabricated at a facility operated and directly supervised by the manufacturer.
2. The manufacturer shall have a minimum of 10 years in steel shelter fabrication.
3. Full Time on Staff Quality Assurance Manager.
4. All welders must be AWS certified for welding steel structures.
5. Membership in the American Welding Society (AWS).
6. Membership in the American Institute of Steel Construction (AISC).
7. Full Time on Staff Licensed Engineer.
8. Published Quality Control System manual.
9. Quality Control System must pass an annual audit by a Third Part Agency.
10. ISO 9001 certification for Powder Coating System.

B. MANUFACTURER'S CERTIFICATIONS

1. Clark County, NV Approved Fabricator.
2. City of Riverside, CA Approved Fabricator.
3. City of Houston, TX Approved Fabricator Structural Steel.

1.06 FIELD OR SITE CONDITIONS

A. Foundations shall be installed per the ICON installation drawings.

1. All foundations shall be cast at the same elevation unless specifically noted on the ICON installation drawings.

B. Anchor bolts shall be placed in the foundation as per the ICON installation drawings utilizing the anchor bolt template supplied with the anchor bolts.

1. Anchor bolts shall be installed per the dimensions and orientation shown on the drawings.

1.07 MANUFACTURER WARRANTY

- #### A. Shelter shall have a 10-year limited warranty on the steel framing members.

- B. Shelter shall have a 10-year limited warranty on the powder-coated elements.
- C. For all Metal Roofing there will be a pass-through warranty direct from the metal roofing supplier, warranty shall be provided on request.

2.01 SHELTER SYSTEM AND MATERIALS

A. MANUFACTURERS:

- 1. Acceptable Manufacturer: ICON Shelter Systems, Inc., 1455 Lincoln Rd., Holland, MI, 49423. Email: info@iconshelters.com, Website: www.iconshelters.com.
- 2. Pricing for this specific project and specified shelter can be requested from: Unique Recreation Consultants
1804 Garnet Avenue 478 San Diego, CA 92109
951-5418380
- 3. The product shall be designed and fabricated at a facility operated and directly supervised by the manufacturer.

B. SUBSTITUTION LIMITATIONS:

- 1. Substitutions must be approved a minimum of ten (10) business days prior to bid. All approved manufacturers shall be notified on writing before the bid date and shall not be allowed to bid without written notification. Any approval of an alternate manufacturer shall be through and official bid addendum prior to the bid date.
- 2. Alternate suppliers shall meet the requirements, qualifications and provide proof of certifications listed under Section 1.05 QUALITY ASSURANCE.
- 3. Alternate suppliers shall provide documentation that the power-coat system being provided meets or exceeds the ICON supplied powder-coat system listed under Section 2.01(c)(8).

C. PRODUCT REQUIREMENTS AND MATERIALS:

1. GENERAL:

- a. The pre-engineered and pre-fabricated package of parts shall be pre-cut and packaged unless noted otherwise. These packages will include all parts and pieces necessary to field assemble the shelter at the jobsite. The shelter shall be shipped in knocked down format to minimize shipping expenses. Field labor will be kept to a minimum with no on-site welding required.

2. CONCRETE FOR FOUNDATIONS:

- a. Concrete shall have a minimum 28-day compressive strength of 2,500 psi unless noted otherwise on the foundation detail.
- b. Reinforcing steel shall be ASTM A615, Grade 60.

3. COLUMNS:
 - a. Hollow Structural Section (HSS) columns shall meet ASTM A500, Grade B with a minimum wall thickness of 3/16" (0.1875").
 - b. Unless the columns are direct buried in the foundation the columns shall attach to the foundation with a minimum of four (4) anchor rods and shall meet OSHA Steel Erection Standard 29 CFR 1926.755(a)(1).
4. STRUCTURAL FRAMING:
 - a. All Hollow Structural Sections (HSS) shall meet ASTM A500, Grade B. "I" Beams, tapered columns or open channel sections shall not be accepted for primary members.
5. COMPRESSION RINGS:
 - a. Compression rings shall be made of ASTM A36 structural plate or of structural channel welded together to form the ring. All connections not requiring compression rings shall use ASTM A500, Grade B HSS sections for these connections.
6. CONNECTION REQUIREMENTS:
 - a. Anchor rods shall be ASTM F1554, Grade 36 unless otherwise noted.
 - b. Structural fasteners shall be ASTM A325 high strength bolts and A563 nuts.
 - c. All structural fasteners shall be hidden within the framing members whenever possible.
 - d. No field welding shall be required to finish the construction of the shelter.
 - e. Manufacturer shall supply extra fasteners.
7. ROOFING MATERIALS:
 - a. PRIMARY ROOF DECK – MEGA-RIB METAL ROOFING
 - 1) Roofing shall be a minimum of 24 gauge Galvalume steel sheet with ribs that are 1 1/2" tall and 7.2" on center. Ribs shall run with the slope of the roof for proper drainage.
 - 2) Roof outside surface shall be a baked on Kynar 500 paint finish and shall be supplied in one of the manufacturer's standard colors: TBD
 - 3) Ceiling color to be a "wash coat" primer.
 - 4) Roof panels shall have the roof angles factory pre-cut to size to provide ease of installation.
 - 5) Metal roofing trim shall match the color of the roof and shall be factory made from 26 gauge Kynar 500 painted Galvalume sheet steel.
 - 6) Trim includes panel ridge caps, hip caps, eave "J" trim, splice channels, rake trim, roof peak cap and corner trim as applicable for the model selected. Trim may need to be field cut to length.

Please refer to the installation drawings for additional information and detail.

- 7) Ridge, hip and valley caps shall be pre-formed with a single central bend to match the roof slope and shall be hemmed on both edges.
- 8) Roof peak caps shall be pre-fabricated with no field assembly required.
- 9) Manufacturer shall supply roof screws painted to match the roof.

8. FACTORY FRAME FINISH:

a. E-COAT/ POWDERCOAT:

- 1) The steel shall be shot-blasted to the specification of SSPC-SP10 near white blast cleaning. SSPC-SP2 hand tool cleaning will not be an acceptable alternative.
- 2) The shot-blasted parts are then washed with zinc-phosphate in an eight (8) stage washer.
- 3) The steel is then immersed in a liquid epoxy and coated through an electro-deposition process (E-coat), this is coated both inside and out to a uniform cover of 0.7-0.9 mils. The E-coat totally encapsulates the part for superior corrosion protection.
- 4) The parts are then coated with a color coat of TGIC polyester powder and then one clear coat for a final finish thickness of 8 to 12 mils.

9. ACCESSORIES

a. ELECTRICAL ACCESS

- 1) Standard in all column bases is a 1 3/4" diameter hole, located in the center of the plate. This allows electrical wiring into the column base.

PART 3 - EXECUTION

3.01 STORAGE AND HANDLING

- A. When the shelter arrives at the jobsite protect the products from weather, sunlight and damage.
- B. When unloading, pad the forks and use other precautions to protect the powder-coated finish. Do not use chains to move the materials, use straps. Handle all materials carefully in the field to avoid scratching the powder-coat finish.
- C. Contractor shall store the product elevated from the soil to allow full air circulation around the materials as do not introduce mold, decay, fungi or insects into or on the materials. One end of the materials shall be elevated higher than the other end if storage will be longer than a few

PROTECTIVE COVERS

13130-6

days as to allow the water to run off the materials.

3.02 INSTALLATION OF MATERIALS

- A. The shelter shall be placed on prepared foundations that were designed by the manufacturer (unless otherwise noted). Materials for these foundations are not supplied by ICON but by the foundation installation contractor. Foundation shall be constructed to all local building code requirements and per good construction practices for the specific site conditions.
 - 1. In accordance with OSHA Steel Erection Standard 29 CFR 1926.750 Part R, anchor rods shall be installed for proper column stability and shall have a minimum of four (4) anchor bolts per column. Therefore no single anchor rod column base connections shall be allowed.
- B. The contractor shall install all parts and pieces per the manufacturer's supplied installation instructions and these specifications.
- C. The interface with other work required is to be coordinated by the customer or the customer's agent. Some design may have electrical or plumbing requirements that are not supplied by ICON.
- D. Tolerances on structural steel members are set according to AISC Code of Standard Practice for Steel Buildings and Bridges and have been used for the fabrication of this product. These tolerances will not and cannot be increased. No field slotting or opening of holes will be allowed without proper guidance from the ICON Engineering Department.

3.03 REPAIR

- A. No field modifications or corrections are allowed without authorization from the ICON Engineering Department.

3.04 SITE QUALITY CONTROL

- A. ICON does not require any on-site inspections or testing but these may be required by local authorities and the local building inspector. Please be aware of any on-site requirements prior to starting installation.

END OF SECTION 10 73 00

PROTECTIVE COVERS

SECTION 13130

SIGNING AND STRIPING

SECTION 1: SIGNS

PART 1- GENERAL

1.01 GENERAL

- A. This work shall include the furnishing and installation of new signs and posts as indicated on the plans.
- B. Roadside signs shall be installed at the locations shown on the plans or where designated by the Engineer and in conformance with the provisions in the Standard Specifications and these special provisions.

PART 2- PRODUCTS

2.01 SIGNS

- A. All sign installations shall have a minimum vertical clearance of 7 ft from the bottom of the sign to grade and a minimum horizontal clearance of 2 ft from face of curb to edge of signpost. There must be a minimum 4 ft clearance from sign post to the back edge of the sidewalk for wheelchair access or as specified by resident engineer. When there is no sidewalk, curb and gutter, the horizontal clearance shall be 6 - 8 ft from edge of pavement. The Contractor shall replace existing sign post if the minimum vertical clearance of the signs cannot be achieved.

PART 3- EXECUTION

3.01 GENERAL

- A. Except for stop signs and street name signs, any warning or regulatory sign with a 3 ft maximum width shall be mounted on street lights whenever possible.
- B. All signs not mounted on streetlights or traffic signal standards shall be attached to a 2 in square perforated fully galvanized (inside and outside) 12-gauge steel tube post. The post shall be anchored in the ground by a two piece, perforated, fully galvanized anchor and sleeve assembly in all cases. The anchor shall be 36 in in length if being installed in soil and may be 30 in

in length if being installed through asphalt concrete or through Portland cement concrete.

- C. All signs shall be installed before the roadway is open to traffic.
- D. However, those signs that are not applicable at the time of opening shall be covered until such time when they become valid.
- E. Existing traffic signs and posts that do not conform to the approved Plans shall be removed by the Contractor.
- F. All signs and posts shall be new unless specified to be reused. Any damaged existing signs or signposts that are denoted as being relocated on the Plans shall be replaced with new materials, as directed by the Engineer.

SECTION 2: PAVEMENT MARKERS/MARKING

PART 1 GENERAL

This work shall consist of the application of painted and/or thermoplastic traffic stripes (traffic lines) and pavement markings at the locations and in conformance with the details shown on the plans or designated by the Engineer, and as specified in these specifications and the special provisions.

PART 2 - PRODUCTS

2.01 PAVEMENT MARKERS/MARKING/STRIPING

- A. Pavement markers shall conform to the provisions of the Standard Specification. The placement of raised pavement markers shall be in accordance with the Standard Specifications and these Special Provisions. The markers shall be installed at locations shown on the plans. Raised blue reflective pavement markers shall be placed directly in front of fire hydrants or otherwise directed by the County Traffic Engineer.
- B. Pavement markings shall be in accordance with the Standard Specification and as directed by the County Traffic Engineer. The materials for lane lines and pavement markings shall be thermoplastic with the exception of bike lane.

PART 3 - EXECUTION

- 2.01. The Contractor shall remove existing raised pavement markers and roughen by sandblasting or grinding all existing pavement markings and lines to improve adhesion of tack coat. Install the raised pavement markers, pavement markings, words, legends, arrows, traffic lines and crosswalks after

applying asphalt concrete overlay per CALTRANS Standard Plans Series A20 and A24 series as applicable. Contractor shall use pavement wording and legend stencils conforming to the latest CALTRANS metric standards. Conflicting striping shall be removed by sand/water blasting.

END OF SECTION 13130 SIGNING AND STRIPING

SECTION 26 05 10

BASIC ELECTRICAL MATERIAL AND METHODS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Work specified in this Section consists of furnishing and installing basic electrical materials and equipment. Use this Section with other Sections of Division 26 - Electrical.

1.02 RELATED SECTIONS

- A. Section 01 33 00: Submittal Procedures
- B. Section 01 43 20: Project Quality Program Requirements
- C. Section 01 66 00: Product Storage and Handling Requirements
- D. Section 01 78 28: Operation and Maintenance Data
- E. Section 05 05 33: Basic Welding Requirements
- F. Section 26 05 26: Grounding and Bonding
- G. Section 26 08 00: Test Support/Start-Up
- H. Section 26 09 18: Controls and Instrumentation

1.03 REFERENCES

- A. American National Standards Institute (ANSI)
 - 1. ANSI B31.1 Power Piping
 - 2. Rigid Steel Conduit - Zinc Coated
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 2. ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 3. ASTM D149 Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
 - 4. ASTM D570 Water Absorption of Plastics
 - 5. ASTM D638 Tensile Properties of Plastics

- | | | |
|-------|---|--|
| | 6. ASTM D695 | Compressive Properties of Rigid Plastic |
| | 7. ASTM D790 | Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials |
| | 8. ASTM D1000 | Pressure-Sensitive Adhesive Coated Tapes Used for Electrical and Electronic Applications |
| | 9. ASTM D1693 | Environmental Stress-Cracking of Ethylene Plastics |
| | 10. ASTM D2240 | Rubber Property - Durometer Hardness |
| | 11. ASTM D4325 | Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes |
| | 12. ASTM D4388 | Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes |
| Red | 13. UL 6A | Standard for Electrical Rigid Metal Conduit – Aluminum, Brass, and Stainless Steel |
| | 14. ANSI C80.1 Conduit | American National Standard for Electrical Rigid Steel (ERSC) |
| | 15. UL 514B | Standard for Conduit, Tubing and Cable Fittings |
| Steel | 16. NECA NEIS 101 | National Electrical Installation Standard for Installing Conduits. |
| | 17. ANSI/ASME B 1.20.1 | Standard for Pipe Threads, General Purpose (Inch) |
| | C. American Welding Society (AWS) | |
| | 1. AWS D1.1 | Structural Welding Code-Steel |
| | D. California Code of Regulations (CCR) | |
| | 1. CCR Title 24 | Part 3, California Electrical Code (CEC) |
| | E. Institute of Electrical and Electronics Engineers (IEEE) | |
| | 1. IEEE C37.301 | Standard for High-Voltage Switchgear (Above 1000V) Test Techniques – Partial Discharge Measurements |
| | F. National Electrical Manufacturers Association (NEMA) | |
| | 1. NEMA KS 1 | Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts maximum) |
| | 2. NEMA RN 1 | Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit |
| | 3. NEMA TC 2 | Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80) |
| | 4. NEMA TC 3 | PVC Fittings for Use with Rigid PVC Conduit and Tubing |
| | 5. NEMA VE 1 | Metallic Cable Tray Systems |

- 6. NEMA WC 7 / Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy. (ICEA S-66-524)
 - 7. NEMA WD 1 General Requirements for Wiring Devices
- G. National Fire Protection Association (NFPA)
- 1. NFPA 70 National Electrical Code (NEC), latest edition
 - 2. NFPA 130 Standard for Fixed Guideway Transit and Passenger Rail Systems
- H. Underwriters Laboratories Inc. (UL)
- 1. UL 5 Surface Metal Raceways and Fittings
 - 2. UL 6 Rigid Metal Conduit
 - 3. UL 20 General-Use Snap Switches
 - 4. UL 50 Safety Enclosures for Electrical Equipment
 - 5. UL 94 Flammability of Plastic Materials for Parts in Devices and Appliances
 - 6. UL 360 Liquid-tight Flexible Metal Conduit, Steel
 - 7. UL 486 Series Wire Connectors and Soldering Lugs for Use with Copper Conductors
 - 8. UL 498 Attachment Plugs and Receptacles
 - 9. UL 514A Metallic Outlet Boxes
 - 10. UL 514B Fittings for Conduit and Outlet Boxes
 - 11. UL 651 Safety Schedule 40 and 80 Rigid PVC Conduit
 - 12. UL 797 (ANSI C 80.3) Electrical Metallic Tubing (EMT)
 - 13. UL 2196 Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control, and Data Cables, Fire Rated Assembly System for emergency system feeders, Circuits, and associated material (pull box, termination, etc.) for underground installation and all other locations.
- I. Conform to following:
- 1. Electrical codes of City Canyon Lake.
 - 3. California Electrical Safety Orders, Title 8 (CES).
 - 4. California Code of Regulations, Title 24 (CCR).
 - 5. Fire Department Ordinances of City and County of Los Angeles.
 - 6. Insulated Cable Engineers Association (ICEA).
 - 7. Illuminating Engineering Society of North America Lighting Handbook (IESNA).
 - 8. National Electrical Safety Code (NESC).

9. Cal/OSHA Standards.

10. Seismic Design Requirements of California Code of Regulation (CCR) Title 24, Part 2, Chapter 16 and Chapter 13 of ASCE 7).

1.04 QUALITY ASSURANCE

- A. Comply with Project Quality Program Requirements (see 1.02 above).
- B. Seismic Restraints - Equipment and installation of electrical materials shall conform to Part II, Appendix A of Seismological Investigation and Design Criteria, in Information Available to Bidders.
- C. Provide material qualification data to CITY or its designee.
- D. Qualify welding procedures and welding operators in accordance with Section 05 05 33 - Basic Welding Requirements. Perform no welding before review and acceptance of welding procedures and welding operator qualification. Perform welding operations as specified in Section 05 05 33 - Basic Welding Requirements.
- E. Field Engineer - Provide a qualified experienced electrical field engineer to perform the following:
 - 1. Prepare and submit detailed Shop Drawings and Catalog cuts of equipment.
 - 2. Inspect equipment for compliance with specified requirements and accepted Shop Drawings at Worksite.
 - 3. Prepare field inquiries.
 - 4. Prepare recommended field modifications to control and equipment received at Worksite.
 - 5. Oversee electrical work installation, and design installations of temporary electrical systems in accordance with NFPA 70.
 - 6. Perform specified field tests.
 - 7. Interpret Contract Documents for subordinates.
 - 8. Witness vendor equipment performance tests and inspection.
 - 9. Review Shop Drawings and report deviations from Contract Drawings to CITY or its designee for review and approval.
 - 10. Stainless Steel Rigid Conduit shall be listed to UL 6A and manufactured in accordance with ANSI C80.1.
 - 11. Electrical equipment and materials shall be new and comply with the latest codes and standards. No used, re-built, refurbished and/or re-manufactured electrical equipment and materials shall be furnished on this project.
 - 13. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

1.05 SUBMITTAL

- A. Refer to Section 01 33 00 - Submittal Procedures, for submittal requirements and procedures.
- B. Identify product data by equipment numbers and submit calculations as required. Operations and maintenance data as specified in Section 01 78 28 - Operation and Maintenance Data. Submittal list shall include but is not limited to the following:
- C. Resume and evidence of qualifications of electrical field engineer within 30 days of Notice to Proceed (NTP).
- D. Material Qualification Data
- E. Shop Drawings - Show control panels, arrangement and location of conduits stubbed for future equipment, cabinet, pull box and assigned space, conduit sleeves for future exposed conduits, and for fabricated work being furnished and installed. Submit at least 180 days before rough-in work or fabrication to prevent delays in Work. Identify equipment by equipment numbers indicated.
- F. Drawings prepared by vendors. Drawings shall be thoroughly checked and stamped by a registered engineer in the State of California.
- G. Evidence of compliance of, conduits, pipe hangers, lighting fixtures, motor control centers, panels and cabinets, transformers, switchgears and all other essential electrical equipment with seismic safety requirements in accordance with City Building Code or CCR, Title 24 applicable in City, within CCR Seismic Hazard Zone 4, whichever describes more stringent requirements, shall be submitted before installation begins.. Where applicable include calculations prepared by a structural engineer licensed by the State of California.
- H. Verified field test reports promptly upon completion of test.
- I. Manufacturer's product data.
- J. Welder certifications and qualified welding procedures for review and record.
- K. Documentation of Conduit Handling. - Provide inspection and sign-off documentation of embedded conduits as specified in Paragraph 3.2 B.6.

1.06 DEFINITIONS (Not Used)

1.07 INTERFACES

- A. Determine interfaces and coordinate Electrical Work with utility company and CITY or its designee.
- B. Determine interfaces and coordinate with Work completed, in progress, to be performed under other Sections, or by other contractors. Make indicated connections to previously completed Work. Provide safe and convenient

provisions for future connections to, or extensions of, the Work as required.

- C. Where necessary, take possession of and maintain electrical equipment left in place by others. Where necessary, leave temporary and interim electrical Work, plant and equipment in place for maintenance and operation by others.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 01 66 00 - Product Storage and Handling Requirements, for general requirements for product delivery, storage, and handling procedures.
- B. Deliver wires and cables to Worksite in unbroken standard coils and reels. Attach tags bearing manufacturer's name, trade name of wire and UL label for 600-Volt wire and cable.
- C. Install thread protectors on both ends of conduit before shipping. Package couplings separately.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Furnish items of material, design, size and ratings required.
- B. Material and equipment shall bear UL label and evidence of UL listing where UL standards exist and product listing is available. Comply with NFPA 70 and CEC.
- C. Provide products free from defects impairing performance, durability and appearance; products shall be commercial quality best suited for purpose intended or specified.
- D. Steel conduit and accessories shall be hot-dip galvanized after fabrication in accordance with ASTM A123.
- E. Materials manufactured for use as conduit (except PVC conduit), raceways, ducts, boxes, cabinets, equipment enclosures and surface finish material shall be capable of withstanding temperatures up to 932 Deg. F (500 Deg. C) for one hour and shall not support combustion. PVC conduit is acceptable when embedded in concrete.

2.02 GALVANIZED RIGID STEEL (GRS) CONDUIT AND ACCESSORIES

- A. GRS conduit, Couplings, Elbows, Bends, Sealing Fittings and Nipples shall meet ANSI C80.1 and UL 6, with each length bearing manufacturer's stamp and UL label.
 - 1. Thickness of zinc coating shall be determined by Referee Test included in Appendix to ANSI C80.1.
 - 2. Exposed conduits shall be GRS unless otherwise specified. Do not use

intermediate metal conduit.

3. Fittings and Accessories

- a. Provide separable watertight hub fittings with gasket, separate nylon insulated throat and case hardened locknut.
- b. Bushings shall be nylon insulated metallic and shall be of the grounding type.
- c. Conduit straps, clamps and clamp backs shall be galvanized malleable iron.
- d. Thread protectors shall be installed on both ends of conduits for shipment and handling.
- e. Package couplings separately.
- f. Rigid steel conduit shall be minimum 3/4 inch diameter where exposed and one inch diameter where embedded.

B. PVC Coated Conduit shall meet NEMA RN 1, Coating Type A-40.

2.02-1 RIGID STAINLESS STEEL (RSS) CONDUIT AND ACCESSORIES (NOT USED)

2.03 LIQUID-TIGHT FLEXIBLE METALLIC CONDUIT AND FITTINGS

- A. Liquid tight flexible metallic conduit shall consist of core of flexible galvanized steel with extruded liquid-tight neoprene jacket overall. Jacket shall be moisture- and oil-proof, capable of minimum NEC allowed radius bends without cracking.
- B. Furnish conduit with continuous copper bonding conductor spiral wound between convolutions; as required by NFPA 70, and as specified in Section 26 05 26, Grounding and Bonding.
- C. Fittings shall meet UL 514B, malleable iron or galvanized steel, cadmium- or zinc-coated.

2.04 PVC ELECTRICAL CONDUIT AND FITTINGS

- A. PVC conduit may be used for embedded portions of subsystems, unless otherwise indicated. Minimum trade size shall be one inch for PVC conduit.
- B. PVC conduit shall be heavy wall, high impact strength, rigid PVC conforming to requirements of EPC-40-PVC conduit in NEMA TC 2 and fittings for EPC-40-PVC conduit in NEMA TC 3 Rated for Direct Burial (BD) or Encased Burial (EB) application
- C. PVC conduit shall be UL 651 listed and installed in accordance with latest edition of NFPA 70 for underground and exposed use.
- D. PVC conduit shall be flammability rated as self-extinguishing, with following minimum properties:
 1. Tensile strength, per ASTM D638 at 78 Deg. F: 5000 psi.

2. Flexural strength, per ASTM D790: 11,000 psi.
3. Compressive strength, per ASTM D695: 8500 psi.
4. Hardness (Durometer D), ASTM D2240: 77.
5. Water absorption, percent maximum in 24 hours at 72 Deg. F, ASTM D570: 0.03.
6. Dielectric strength, volts per mil, per ASTM D149: 1100.
7. Thermal conductivity: 1.3 Btu/square foot.

2.05 CONDUIT EXPANSION FITTINGS

- A. Fittings shall be fabricated from similar material to type conduit run they are used in.
- B. Include factory installed packing ring and pressure ring to prevent entrance of moisture.
- C. Include grounding ring or grounding conductor for metallic expansion couplings.

2.06 MULTIPLE PIPE HANGERS (TRAPEZE TYPE)

- A. Fabricate trapeze hangars from two or more steel hanger rods, a steel horizontal member and U-bolts, clamps and other attachments necessary for securing hanger rods, cable trays and conduits.
- B. Hanger Rod shall be 3/8 inch diameter minimum, threaded full length or enough distance at each end to permit minimum 1 1/2 inches of adjustment.
- C. Horizontal Member
 1. Standard structural steel shapes, angles and channels: 1 1/2 by 1 1/2 or 1 5/8 by 1 5/8 inches, 12 gauge, cold-formed, lipped channel; designed to accept special spring-held hardened steel nuts for securing hanger rods and other attachments.
 2. Two or more channels may be factory welded together to form horizontal members of greater strength.
 3. Galvanize after fabrication in accordance with ASTM A153.
- D. Design shall comply with requirements for seismic restraint.
 1. Support load including to sum of weights of conduits and wires, and weight of hanger, plus 200 pounds.
 2. Stress at root of thread of hanger rods shall not exceed 9475 psi at design load.
 3. Size horizontal member to limit maximum stress of not more than 12,650 psi at design load.

2.07 INSERTS

A. Channel Inserts

1. Fabricate from cold-formed steel channels 12 gauge or thicker; overall size 1 1/2 inches by 1 1/2 inches or 1 5/8 inches by 1 5/8 inches; continuous slot 7/8 inch wide; lengths as indicated, equivalent to Unistrut P3770 series. Galvanize after fabrication in accordance with ASTM A153.
2. For Embedding in Concrete
 - a. Fabricate from channels having a solid base.
 - b. Weld concrete anchors to channel during fabrication and before coating.
 - c. Clean and galvanize after fabrication.
 - d. Provide assemblies with minimum pull-out load rating of 4500 pounds per linear foot uniformly distributed.
 - e. Furnish channel inserts for embedded installation in concrete with channel interior completely filled with Styrofoam.
3. For Surface Mounting
 - a. Fabricate from channel with 3/8 inch by three inch slots on four inch centers in base.
 - b. Galvanize inserts for surface mounting on concrete surfaces, and for installation in damp or wet areas in accordance with ASTM A153.
 - c. Use galvanized expansion shield type anchor bolts.

B. Spot Inserts for Embedding in Concrete

1. Galvanize Steel Products after fabrication in accordance with ASTM A153.
2. Design for maximum loading of 800 pounds with safety factor of three.
3. Knockout openings shall accommodate square or rectangular nuts.

2.08 SURFACE METAL RACEWAYS AND FITTINGS

- A. Conform to UL5 and NFPA 70.

2.09 OUTLET, JUNCTION AND PULL BOXES

- A. Conform to latest edition of NFPA 70, and CEC.
- B. Electrical boxes shall conform to UL 50 and UL 514B.
- C. Provide electrical boxes of material, finish, type and size required for location, kind of service, wire fill, and function. Provide NEMA 4 rated boxes with exterior mounting ears where indicated on the contract documents or compliance with NFPA 130.
- D. Provide boxes complete with accessible covers designed for quick removal and suitable for purpose intended; equip boxes having no devices or fixtures installed with flat or raised blank covers as required. Ceiling fixture outlet boxes shall be

equipped with 3/8 inch boltless fixture studs.

- E. Junction and pull boxes less than 100 cubic inches in size shall be cast metal for exposed installation and pressed steel for embedded installation. Boxes more than 100 cubic inches in size shall conform to requirements for cabinets, except as interface pull boxes where sheet metal boxes with gasket covers shall be used.
- F. Covers shall be same thickness as pressed steel boxes; secured in position by No. 10- 24 stainless steel machine screws. Arrange covers to be readily and conveniently removed.
- G. Concealed and embedded junction boxes shall be zinc-coated inside and out. Where outlet boxes are used as junction boxes they shall be minimum four inches square by 1 1/2 inches deep. Provide flat blank covers.
- H. Lighting Outlet Boxes
 - 1. Use cast metal for exposed installation, not smaller than four inches round or square by 2 1/8 inches deep.
 - 2. Pressed steel boxes may be used for embedded and concealed installation where approved for intended purpose.
- I. Concealed or embedded switch or receptacle boxes shall be pressed steel, four inches by 2 1/8 inches by 2 1/8 inches deep minimum size. Use cast metal boxes for exposed installations.
- J. Cast metal boxes shall be steel or ferrous alloy, with compatible conduit fittings.
- K. Boxes for exposed switches and receptacles shall be cast metal, FS and FD Types.
- L. Furnish necessary adapter plate for mounting devices on light fixtures, brackets, supports, hangers, fittings, bonding jumpers and other accessories required.
- M. Provide neoprene gaskets 1/8 inch thick for boxes subjected to weather. Provide fire resistant gaskets 1/8 inch thick in compliant with NFPA 130.
- N. Provide each box with a grounding terminal.
 - 1. Grounding terminal shall be green-colored washer-in-head machine screw not smaller than No. 10-32 in a drilled and tapped hole in back of box, or a grounding bushing with green-colored machine screw terminal attached to one conduit.
 - 2. Provide suitable grounding terminals in motor connection boxes.
 - 3. Install grounding jumpers as specified in Section 26 05 26, Grounding and Bonding.

2.10 CONNECTORS AND INSULATING TAPES

- A. Splice and Terminal Connectors

1. Provide termination fittings for use with cable furnished, fittings shall be NEMA standard and UL 486 listed.
2. Termination and splice fittings for No. 10 and smaller conductors shall be screw-on, spring-pressure type copper connectors with nonflammable, self-extinguishing insulation of temperature rating equal to that of cable being connected. Terminals shall provide metal grip on conductor for strain relief.
3. Termination and splice fittings for No. 8 and larger conductors shall be tool-applied compression connectors of material and design compatible with conductors.
4. Terminal connectors for conductor size No. 4/0 and larger shall be long-barrel, double compression type, with two NEMA standard bolting holes in pad.
5. Provide heat-shrinkable insulator for compression type connectors and splices inside motor box.

B. Insulating Material for Splices and Terminations

1. Tape shall be approved by CITY or its designee for particular use, location and voltage, 3/4 inch nominal width.
2. Plastic electrical insulating tape for general use shall be pliable at minus 18 Deg. C to 105 Deg. C. When tested in accordance with ASTM D4325 and ASTM D4388, tapes shall meet the following criteria:
 - a. Thickness: Seven mils.
 - b. Breaking strength: 15 pounds per inch.
 - c. Elongation: 200 percent.
 - d. Dielectric strength: 1250 volts/mil.
 - e. Insulation resistance (direct method of electrolytic corrosion): 10 megohms.
3. Rubber electrical insulating tape for protective over-wrapping shall be silicone rubber with silicone pressure-sensitive adhesive. When tested in accordance with ASTM D1000, tapes shall meet the following criteria:
 - a. Elongation: 525 percent.
 - b. Dielectric strength: 875 volts.
 - c. Insulation resistance (indirect method of electrolytic corrosion): 10 megohms.
4. Mark tape packages to indicate shelf-life expiration date.

2.11 WIRING DEVICES

- A. Wiring devices include switches, duplex receptacles and special outlets installed in raceway and conduit boxes, complete with cover plates.
- B. Switches
 1. AC tumbler-toggle switches shall be specification grade, heavy duty type meeting minimum requirements of UL 20.

2. Switches shall operate in any position and be fully enclosed with entire body and cover of molded phenolic, urea or melamine. Fiber, paper or similar insulating materials in body or cover are not acceptable.
3. Equip switches with metal mounting yoke with plaster ears, insulated from mechanism and fastened to switch body using bolts, screws, rivets or other substantial means.
4. Provide green-colored equipment grounding screw on yoke.
5. Section of yoke normally intended to bear on surface outside box shall have a minimum overall width of 3/4 inch, measured at right angles to longitudinal axis of yoke.
6. Switch contacts shall be silver or silver alloys.
7. Switches may be back or side wired with terminals of screw or combination screw- clamp type.
8. Terminal screws shall be No. 8 or larger and of captive or terminal type.
9. Provide access holes for back wiring.
10. Wiring terminals shall receive and hold proper wire sizes as shown below:

<u>SWITCH RATING</u>	<u>WIRE SIZE, AWG NO.</u>
20 amperes	10 and/or 12
30 amperes	8

11. Wall switches shall be tumbler type, totally enclosed, heavy-duty, in accordance with NEMA WD 1, color as selected by CITY or its designee.
12. Switches for use on LED lighting circuits shall be fully rated 20 or 30 amperes at 120 or 277 volts, as required.
13. Switches controlling straight resistance loads shall be snap switches as specified, of proper rating up to 30 amperes at 120/277 volts.
14. Provide 120/277 VAC rated snap switches capable of withstanding tests outlined in NEMA WD 1, Paragraphs WD 1-2.04, WD 1-2.05A, WD 1-2.05C, WD 1-2.05E2, WD 1-2.05F2 and WD 1-2.05 G. If requested by CITY or its designee, submit evidence of proposed switch types having passed specified tests.
15. Time clock shall be solid state electronic programmable astronomical time switch suitable for indoor use, with not less than four channels; Intermatic Electronic time Switch Model No. ET 90000 Series, Tork Digital, or approved equivalent.

C. Receptacles and Plugs

1. Connector and outlet receptacles shall meet UL 498 and NEMA WD 1 for heavy-duty general use type.
2. Receptacle bodies and bases shall be fire-resistant non-absorptive hot molded phenolic composition material or approved equivalent with metal plaster ears integral with supporting member.
3. Receptacles shall be flush type, unless otherwise indicated.

- a. Wall receptacles shall be single or duplex as indicated, specification grade, 120 Vac, 60 Hz, 15/20 ampere.
- b. Provide receptacles and plug caps with light colored terminal facilities for neutral connections, amber or brass colored for phase conductor connections and green colored hexagonal machine screws for equipment grounding conductor and connections.
- c. Receptacle contacts including grounding contact shall be double grip bronze type with spring steel backup clips to ensure both sides of each male prong of plug will be in firm contact.
- d. Provide receptacles with self-grounding clip or mounting strap screws.
- e. Ground fault circuit interrupter duplex receptacles shall be 120 volt, 60 Hz, 20 ampere with built-in test and reset buttons, and ground fault tripped indication. Circuitry shall interrupt circuit within 1/30 second on a five milliampere earth leakage current. Devices shall be designed for end of run installation or with provisions for feeding through to protect other outlets on a circuit. Maximum circuit capacity 20 amperes. Furnish receptacles with necessary wire connectors, clips, mounting screws and instructions.

D. Cover Plates

1. Provide cover plates conforming to UL 514A for switches, receptacles and special purpose outlets.
2. Use multi-gang plates for multi-gang boxes.
3. Covers
 - a. In non-public concealed or embedded installations use Stainless steel.
 - b. For exposed installations use cast metal, compatible with boxes.
 - c. In public areas uses Stainless steel, with No. 4 finish.
 - d. For commercially produced special-purpose outlets using special material, configuration and size use brushed stainless steel designed for particular application.
4. Where commercial plates of specified material and finish are not available for special-purpose outlets use plates suitable for enameling to match adjacent surface.
5. For flush devices use stainless steel, 0.040 inch thickness.

2.12 DISCONNECTING DEVICES

- A. Safety-Switch Type Disconnecting Devices shall be enclosed, conforming to IEEE C37.35.
- B. Heavy-duty Safety Switches (600 VAC) shall meet NEMA KS1 requirements.
 1. Furnish heavy-duty safety switches of electrical characteristics, ratings and accessories as indicated.
 2. Furnish switches with NEMA 12 industrial-duty enclosures, metal nameplates

front cover mounted, containing a permanent record of switch type, catalog number and hp ratings.

3. Furnish handle with visible blades, reinforced fuse clips; nonteasible, positive, quick-make quick-break mechanism, and pad-lockable in OFF and ON positions.

C. Fuses shall be UL approved, current-limiting type, 200,000A interrupting capacity, dual-element, time-delay for motor and circuit protection.

2.13 INDIVIDUAL CONTROL RELAYS

A. Provide convertible contacts rated a minimum of 10 amperes, 600 volts. Verify coil voltage, and number and type of contacts. Furnish in NEMA 1 enclosures. Relay specifications shall be per Section 26 09 18, Controls and Instrumentation.

B. The following are acceptable manufacturers, other equivalents may be submitted for approval.

<u>MANUFACTURER</u>	<u>TYPE</u>
Allen-Bradley	Bul. 700, Type
BX Cutler-Hammer	Bul. 9575
General Electric	Class CR2811
Westinghouse	Bul. 16-321, Type
NH Potter Brumfield	Series KRP

2.14 PULL CORDS

A. Nylon, minimum 240 pounds tensile strength.

2.15 MANDRELS

A. Solid cylinder type for conduits three inches in diameter and larger installed with large bend radius. Mandrels shall be formed of high-strength aluminum alloy with steel center rod and cast iron eyes. Outside diameter of mandrel shall be not smaller than 1/4 inch less than inside diameter of conduit to be mandrel. Mandrel length shall be six inches minimum. For smaller conduits or conduits with sharp bends, use flexible mandrel or shorter length mandrel (ball-shaped mandrel similar to Ensley "Go No Go" mandrel).

PART 3 - EXECUTION

3.01 GENERAL

A. Install items in locations indicated, rigid and secure, plumb and level, and in

alignment with related and adjoining Work to make complete workable system. Do not weld electrical conduits and enclosures to supports. Bolt, screw or clamp to hold and fasten firmly in place. Installation shall be designed for easy removal and future replacement.

- B. Furnish anchor bolts and anchorage items as required; field check to ensure proper alignment and location. Provide templates, layout drawings, and supervision at Worksite to ensure correct placement of anchorage items in concrete. Check embedded items for correct location and detail before concrete is placed.
- C. Install supporting members, fastenings, framing, hangers, bracing, brackets, straps, bolts and angles as required to set and rigidly connect Work; conform to CCR requirements for seismic design Category D and in conformance to seismic design requirement of California Code of Regulation (CCR) Title 24 Part 2 Chapter 16 and ASCE 7
- D. Control erection tolerance requirements; do not impair strength, safety, serviceability or appearance of installations. Determine exact locations of conduit. Route conduit parallel to building lines unless otherwise indicated.
- E. Trade size, type and general routing and location of conduits, raceways and boxes shall be as indicated or specified.
- F. Install exposed conduit to avoid conflicts with other work. Install horizontal raceways close to ceiling or ceiling beams, and above water and other piping wherever practicable.
- G. Install individual conductors and multiple-conductor sheathed cables in conduits, raceways, cable trays, ducts and trenches as indicated to complete wiring systems.
- H. Install switches, receptacles, special-purpose outlets and cover plates complete in neat manner, in accordance with NFPA 70 and local electrical codes. Plug unused openings in boxes, cabinets and equipment.
- I. Stainless Steel Rigid Conduit shall be installed in compliance with the latest version of the National Electrical Code and other applicable codes and standards as indicated elsewhere in these specifications.
- J. Stainless Steel Rigid Conduit shall be installed in accordance with NECA National Electrical Installation Standard (NEIS) 101, Standard for Installing Steel Conduit.

3.02 CONDUIT AND FITTINGS

- A. Metallic and Nonmetallic Electrical Conduit
 - 1. Install conduit in accordance with NFPA 70 and CEC and as indicated. Prevent concrete and other materials from entering and obstructing conduit, outlets, and pull and junction boxes. Do not use conduit smaller than 3/4 inch for exposed Work and one inch minimum for embedded Work.

2. Unless otherwise indicated, make conduit bends in accordance with NFPA 70 and CEC, with not more than three 90 degrees bends, 270 degrees total, per run of conduit for traction power and four 90 degrees bends, 360 degrees total, otherwise. Where more bends are required in a particular run, install pull boxes as required to facilitate pulling conductors. Communication conduits type "CT" in duct banks or embedded in base slab shall use gradual bends with no more than 180 degrees total.
3. Metallic conduit installed for future extension shall terminate with couplings flush to finished floor level or wall, unless otherwise indicated. Provide threaded plug for open end. Extensions to existing Work shall match existing size.
4. Provide stainless steel metallic numbering tags indicating conduit number on end of conduit. Identify train control and communication conduits; provide plug for open end.
5. Properly support and anchor conduit to be embedded; maintain correct location and spacing and prevent flotation during concreting operations.
6. When exposed or buried conduit passes through expansion or contraction joint in structure, install conduit at right angles to joint and provide approved conduit expansion fitting at joint. Paint conduit with approved bituminous compound for one foot on each side of expansion couplings.
7. Provide expansion fittings in conduit runs as required to compensate for thermal expansion.
8. Conduit embedded in concrete shall be spaced three times diameter of larger conduits and embed at or near center of slab or wall. Rigidly support embedded conduits with rebars attached to structural rebars at center of slab; prevent sag during and after pouring of concrete.
9. Pull mandrel and swab through embedded conduit after installation to remove foreign matter. Draw mandrel through completed conduit run manually without mechanical assistance. After conduits are cleaned and mandrel, install rope, cover boxes, and securely seal both ends of conduit with caps as indicated. If obstructions are encountered which cannot be removed, or if conditions exist which may result in damage to wires and cables pulled through conduit, install new conduit. Have CITY or its designee witness mandrelling of conduits for which cables will be installed by others.
10. Conduit exposed to different temperatures shall be sealed to prevent condensation and passage of air from one area to the other.
11. GRS conduits shall be electrically and mechanically continuous; connect to ground by bonding to grounding system.
12. Apply conductive compound to threads of threaded rigid conduit joints. Do not use compounds containing lead. Terminate conduit in appropriate boxes at motors, switches, outlets and junction points.
13. When field cutting of conduit is required, thread and ream conduit to remove rough edges. Where conduit enters box or other fitting, provide bushing to protect wire from abrasion. Provide insulation type bushings and double locknuts on ends of rigid conduits terminating at steel boxes, panelboards, cabinets, motor starting equipment and similar enclosures. Smooth rough surfaces and restore galvanized coating.
14. Support individual horizontal conduits not larger than 1 1/2 inches diameter with one-hole conduit straps with back spacers or individual conduit hangers.
15. Conduits installed against concrete surfaces shall be held away from surface

- by clamp backs or other acceptable means.
16. Support individual horizontal conduits larger than 1 1/2 inches diameter by individual hangers and forged steel conduit strap for vertical runs.
 17. In dry locations, spring steel fasteners, clips or clamps specifically designed for supporting exposed single conduits may be used instead of conduit straps or hangers.
 18. Hanger rods used in connection with spring steel fasteners, clips and clamps shall be 1/2 inch diameter galvanized steel rods or, if concealed above suspended ceiling, galvanized perforated steel strapping. Do not use wire for support of conduit.
 19. Support parallel conduits at same elevation on multiple conduit hangers or channel inserts. Secure each conduit to pipe hanger or channel insert member by U-bolt, one-hole strap or other specially designed and approved fastener suitable for use with pipe hangers or channel inserts.
 20. Space supports not more than 10 feet on centers for vertical conduits spanning open areas. Securely anchor conduit at each end; do not interfere with installation and operation of equipment at location.
 21. Conduits and raceways above suspended ceilings shall be supported from floor construction above or from main ceiling support members; use applicable methods as specified.
 22. Install liquid-tight flexible metal conduit at structural construction joints, at motor connections and where required so liquids run off surface and do not drain toward fittings. Provide sufficient slack to reduce effects of vibration. Running threads are not acceptable. Where necessary for connecting conduits, use right-hand and left-hand couplings.
 23. Provide stainless steel metallic tags indicating numbers and total angle of bends in conduits embedded in concrete.
 24. In areas of floating slabs, install horizontal runs of conduit beneath floating slab. Do not pass conduit through floating slab unless conduit is required to terminate in a vertical direction. Provide 1/4 inch clearance between floating slab and vertical conduit riser. Fill space around conduit with rubber-base waterproofing compound.
 25. Tag unscheduled conduit in manner approved by CITY or its designee.

B. Nonmetallic Electrical Conduit

1. Cap or plug ends of embedded conduit with permanent cap or plug to prevent concrete and other materials from obstructing conduit. Do not use duct tape to temporarily seal conduit before concrete placement.
2. Sandpaper joints in PVC conduit; remove burrs, clean and dry joints, and brush with solvent cement recommended by manufacturer.
3. Support conduit to maintain correct location and spacing during concreting operations; provide suitable plastic supports and spacers for conduit ductbanks.
4. Nonmetallic electrical conduit stubbed up to be connected to metallic conduit shall have embedded metallic coupling flush with floor or wall.
5. Other installation requirements - As specified for metallic electrical conduit.
6. Notify CITY or its designee for inspection and sign-off at conduits to be embedded in concrete before issuing concrete pouring permit.

C. Pull Cords

1. Do not splice pull cords.
 2. Leave ample slack length at each end of pull cords.
- D. Filling Openings - Where slots, sleeves and other openings are provided in floors and walls for passage of raceways, including bus ducts, fill openings as follows:
1. Use fire-resistive filling material for openings similar to material of floor, wall or ceiling being penetrated; finish to prevent passage of water, smoke and fumes.
 2. Where conduits passing through openings are exposed in finished rooms, use filling material that matches, and is flush with, adjoining finished floor, ceiling or wall.
- E. Embedded Conduit inside - Mandrel and swab embedded conduits. Remove foreign matter that may damage cable insulation. Draw mandrel through each completed conduit run by hand without mechanical assistance. After conduits are cleaned and mandrelled, install rope, cover boxes, and securely seal both ends of the conduit with caps as indicated. Where obstructions cannot be removed, or condition exists which may result in damage to cable installation, notify CITY or its designee, remove obstructed conduit, and install new conduit as directed by CITY or its designee.

3.03 EMBEDDED INSERTS

- A. Channel Inserts shall be installed with slotted face flush with finished concrete surface.
- B. Spot Inserts shall be installed with insert face flush with finished concrete surface, firmly embedded, with no evidence of movement.
- C. Test five selected inserts, as required by CITY or its designee, by suspending an 800 pound weight from insert. If there is evidence of failure, replace inserts.

3.04 SURFACE METAL RACEWAYS

- A. Securely ground surface metal raceways to outlet boxes or to backplates and fixtures by means of bolts, screws or other acceptable methods and as specified in Section 26 05 26, Grounding and Bonding.
- B. Install surface metal raceways where indicated, in accordance with 2014 edition of NFPA 70 and CEC. Use fittings and accessories designed for raceway.

3.05 OUTLET, JUNCTION AND PULL BOXES

- A. Outlet Boxes
 1. Unless otherwise indicated, flush-mount outlet boxes with front edges of boxes, or attached tile covers flush with finished wall or ceiling.
 2. Mount boxes with long axis of devices vertical unless otherwise indicated.
 3. Locate boxes and box knockouts without interference with reinforcing steel.
 4. Unless otherwise specified, provide for tile covers boxes in tile walls and ceilings. Do not install covers until finished tile line is determined for particular

location.

5. Mounting height indicated for wall-mounted outlet box shall be measured from finished floor to horizontal centerline of cover plate.
6. Mount outlet boxes for switches and receptacles located on columns and pilasters to prevent interference with installation of partitions.
7. Card reader boxes located near doors shall be installed on lock side unless other locations are approved by CITY or its designee.

B. Junction and Pull Boxes

1. Install covers readily accessible after completion of installation.
2. Do not install boxes above suspended ceilings, except where ceiling is removable type or where definite provisions are made for access to each box.

C. Boxes Set in Concrete

1. Support boxes to prevent movement during placement of concrete.
2. Plug and mask unused nailing holes and other holes in side or bottom of boxes. Unplugged or uncovered holes are not permitted.
3. After installation, clean boxes placed in concrete.

3.06 WIRING

A. General

1. Provide wiring complete as required. Provide ample slack wire for motor loops, service connections and extensions. In outlet and junction boxes provided for installation of equipment by others, coil and tape ends of wires and install blank covers.
2. Measure insulation resistance of wiring system before connecting to terminal blocks, motors, switchgear, motor control centers, transformers, panelboards and cabinets. Applied potential: 500 volts DC for control wiring, and 1000 volts DC for power cables for one minute. Insulation resistance shall be two megohms minimum for control cables and 10 megohms minimum for power cables.
3. Do not bend cables to radii less than 12 times outside diameters, except where conditions make specified radius impracticable and shorter radii are permitted by NFPA 70 and NEMA WC 7, Appendix N.
4. Neatly and securely bundle conductors located in branch circuit panelboards, cabinets, control boards, switchgear, motor control centers and pull boxes. Use nylon bundling straps.
5. Test cables for continuity before termination.

B. Cable Supports - Install cable supports for vertical feeders in accordance with latest edition of NFPA 70 and CEC.

C. Splices and Terminations

1. Make wire and cable splices only in outlet, junction and pull boxes, or in equipment cabinets. Splices in conduit or raceway will not be permitted. Make splices with compression type connectors and cover with tape to insulation level equal to that of cable.
2. Use positive type connector installation tools as recommended by manufacturer.

3. Mechanical hand tools, with dies for each conductor size as recommended by manufacturer, may be used on conductor sizes up through No. 6.
4. For conductor sizes larger than No. 6, use hydraulic tools with hexagonal or circumferential installing dies for each conductor size, as recommended by manufacturer.
5. Die used shall clearly mark die number on completed connectors.

3.07 WIRING DEVICES

- A. Locate switches and general-purpose duplex receptacles 48 inches above finished floor, unless otherwise indicated.
- B. Rigidly attach receptacles to outlet box with at least two screws.
- C. Exterior locations - Mount receptacles in watertight cast type outlet boxes with threaded hubs or bosses and equip with gasketed cover and captive cap of screw or twist type.
- D. Provide equipment permanently connected to exterior receptacles, and in areas subject to spray or hose cleaning, with watertight male plugs to suit. Receptacles shall be ground-fault-circuit-interrupter type, as specified.
- E. Furnish matching plug with each power receptacle installed in Work as indicated.

3.08 WELD INSPECTION

- A. Perform visual Inspection on all welds per AWS D1.1 or ANSI B31.1 as applicable.
- B. Perform Magnetic Particle Inspection on 10 percent of welds per AWS D1.1 or ANSI B31.1 as applicable.
- C. Perform Ultrasonic Inspection on 10 percent of full penetration welds 3/8 inch thickness per AWS D1.1 or ANSI B31.1, as applicable.
- D. If failure occurs in first 10 percent sample, select second 10 percent sample and test. If no failure occurs in second 10 percent sample, all represented welds shall be acceptable; rework failed sample in initial 10 percent sample. If failure occurs in second 10 percent sample, welds shall be 100-percent tested.

3.09 HOUSEKEEPING EQUIPMENT CONCRETE PADS

- A. Housekeeping pad reinforcing shall conform to ACI standards for minimum area and concrete coverage.
- B. Equipment housekeeping concrete pad design shall be reviewed and approved by Structural Engineer.
- C. High concentrated loads or point load supported equipment shall require special

PROTECTIVE COVERS

13130-23

tie down and anchoring.

- D. Concrete used shall be minimum 3000 psi standard weight.
- E. Anchor bolts per UBC.
- F. Freestanding power equipment pad.
- E. Maintain the cable manufacturer's color-coded wrapper along the cable length from the location where the outer jacket has been cut to the location where the binder group reaches the terminal strip on which it is to be terminated.
- F. Terminating of wires shall be done in the following manner:
 - 1. "A" line type blocks: Loop the solid conductor around the terminal such that the end of the conductor is pointing in a clockwise direction and securely clamp the conductor between the brass washers by means of the nut provided on the terminal post. Allow suitable slack in all wires adjacent to their terminals.
 - 2. 66 type blocks: Use tools required to comply with manufacturer's installation recommendations. Conductors of cables terminated on 66 type blocks shall be no larger than size 22 AWG.
 - 3. Other types of termination may be submitted for approval, but no terminating shall be done until an approval in writing is received.
- G. When terminating a new cable in an existing piece of equipment, where available facilities are not sufficient, provide new terminating facilities within the equipment and rearrange existing terminating facilities and terminations, if required, in order to terminate the new cable. Terminate the new cable in accordance with approved working drawings. Perform work of this nature only in the presence of a duly authorized representative of CITY.
- H. The Contractor will be allowed to cut existing tags and remove them from wires without removing the wires from the terminal post. Apply new tags to existing cable pairs and wires carrying special circuits by means of an approved nylon cord in an approved manner. Exercise care in removing old tags to prevent damage to the wires or the insulation or braid on the wires.
- I. Wiring shall be done in a neat and skillful manner, and have a satisfactory final finished appearance.
- J. Terminating wires and cables in equipment.
 - 1. Pull the end of the wire or cable into the case or other equipment housing for an approved distance. Closely and neatly group the wires of the cable and bundle them at a maximum of 4-inch intervals using an approved cable tie.
 - 2. Loop the group of wires around in the equipment housings to allow for sufficient slack as directed and then spread out and terminate. Form and support the wires in an approved manner to remove the weight of the wires from the terminals. Ensure that the internal wiring between terminal boards and relays does not become damaged and is not crowded out of shape.
 - 3. Some equipment is provided with hand holes to facilitate pulling and connecting wire and cable. Whenever a hand hole is removed, replace it in such manner

as to make an absolutely watertight seal.

4. In general, connect wires to the terminal boards so that each wire will be terminated without crossing the front of the terminal board.

K. Terminate cable pairs in the sequence indicated by the cable color code.

3.10 Terminating Wires of Fire Detection/Alarm System and Methane Gas Detection System.

- A. Fire alarm and gas detection conductor terminations shall be numbered terminals or terminal strips. Fire alarm and gas detection conductor terminations shall be within junction boxes, device back-boxes, terminal cabinets, control panels or other suitable metal enclosures. Terminals and terminal strips shall be suitable for the size and number of conductors connected to them.
- B. Design connections and end-of-line devices to be accessible for inspection and servicing.
- C. Terminations to terminals shall use crimp-on ring-type or Y-type spade connectors.
- D. Splices shall be permitted in shield drain conductors only. Such splices shall use a crimp type pigtail or parallel connector and be taped to prevent shorts to ground.
- E. Wire fire alarm and gas detection system initiating and indicating devices to allow supervision of their associated conductors through the device, such that disconnecting any conductor from the device will cause a trouble indication at the fire alarm control panel, or remote fire alarm control panel.
- F. Conductors looped around terminals are not acceptable.
- G. Wire nuts are not acceptable.
- H. Wire nuts are not acceptable.
- I. Size device backboxes, junction boxes and terminal cabinets to accommodate the number of conductors contained therein. Extension rings or extension boxes are not acceptable.
- J. Other types of termination may be submitted for approval, but no terminating shall be done until approved.

3.11 Tagging of Cables and Wires of the Fire Detection/Alarm System, Methane Gas Detection System, and Security System; Device Labels.

- A. Tag all new conductor pairs of the fire detection/alarm system, methane gas detection/alarm system and security system at the control panel, intermediate/remote panels, termination cabinets and device locations. Submit for approval a tagging/nomenclature scheme appropriate for the system type.
- B. The tag shall be made of vinylite plastic and have a clear laminated overlay to

protect the printed surface. The tag shall be designed to withstand abrasion, water, oil, and gasoline, and to be vermin-proof and fungus-proof. The information shall be in black printing on a white background.

- C. Furnish and install address/loop labels on each fire detection/alarm system, methane gas detection/alarm system and security system device and device enclosure. The label shall be a black-on-clear self-adhesive tape. Submit label width, font size and type.

END OF SECTION 26 05 10

SECTION 26 05 17

DRY TYPE TRANSFORMERS 0.100 – 150KVA 600V

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Furnishing, installing, connecting and testing dry-type transformers as indicated.

1.02 RELATED SECTIONS

- A. Section 01 33 00: Submittals Procedures
- B. Section 01 43 10: Project Quality Program Requirements - Design/Build or Section 01 43 20: Project Quality Program Requirements - Design/Bid/Build (as applicable)
- C. Section 01 66 00: Product Storage and Handling Requirements
- D. Section 01 78 23: Operation and Maintenance Data
- E. Section 26 05 10: Basic Electrical Materials and Methods
- F. Section 26 05 26: Grounding and Bonding
- G. Section 26 08 00: Test Support/Start-Up

1.03 REFERENCES

- A. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA ST 20 - Dry-Type Transformers for General Applications
 - 2. NEMA TP 1 - Guide for Determining Energy Efficiency for Distribution Transformers
 - 3. NEMA TP2 Standard Test Method for Measuring Energy Consumption of Distribution Transformers
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 70 - National Electrical Code (NEC), latest edition.
- C. California Code of Regulations (CCR):
 - 1. CCR Title 24, Part 3 - California Electrical code (CEC)

1.04 QUALITY ASSURANCE

- A. Comply with Project Quality Program Requirements (see 1.02 above).
- B. Conform to NFPA 70, CEC, and to local codes and regulations and be UL listed.
- C. Equipment of same type, size, rating, functional characteristics and make shall be interchangeable.
- D. Seismic Criteria: Mechanical and Electrical components and their supports shall satisfy the Seismic Design Requirements of California Code of Regulation (CCR) Title 24, Part 2, Chapter 16 and Chapter 13 of ASCE 7 and as specified in Section 26 05 10 – Basic Electrical Materials and Methods.
- E. Transformers shall meet the requirements of federal law 10 CFR Part 431 “Energy Efficiency Program for Certain Commercial and Industrial Equipment”.
- F. The manufacture of the assembly shall be the manufacturer of the major components within the assembly.
- G. For the equipment specified herein, the manufacture shall be ISO 9001 or 9002 certified.
- H. The manufacture of this equipment shall have produced similar electrical equipment for a minimum of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

1.05 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures, for submittal requirements and procedures.
- B. Maintenance data and operating instructions as specified in Section 01 78 23 - Operation and Maintenance Data, including following:
 - 1. Description of equipment and components.
 - 2. Manufacturer's operating and maintenance instructions, parts list, illustrations, and diagram of components.
 - 3. Recommended list of spare parts.
 - 4. Wiring diagram.
 - 5. Physical layout and weight.
- C. Factory Test Report. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest revision on ANSI and NEMA standards. Submit one copy for each set of shop drawings being submitted.
 - 1. Ratio tests at the rated voltage connection and at all tap connections.
 - 2. Polarity and phase relation tests on the rated voltage connection.
 - 3. Applied potential tests.

4. Induced potential tests.
5. No-load and excitation current at rated voltage on the rated voltage connection.
6. Resistance measurements of all windings on the rated voltage connection and at the tap extremes.
7. Manufacturer's nonlinear load test representing real world load mix. Transformers not meeting this requirement shall not be installed.

D. Field test reports.

E. Manufacturer's product data and seismic calculations.

F. Test procedures specified in Section 26 08 00 - Test Support/Start-Up.

G. Certificates of Compliance for transformers.

1.06 DEFINITIONS (Not Used)

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 01 66 00 - Product Storage and Handling Requirements, for general requirements for product delivery, storage, and handling procedures.
- B. Securely wrap and package each unit to prevent damage. Clearly label packaging.
- C. Store transformers in secure and dry storage facility.

PART 2 - PRODUCTS

2.01 DRY-TYPE TRANSFORMER

- A. Two-winding, Copper, Class H, with full capacity taps on high voltage winding per NEMA ST 20. Auto-transformer type is not acceptable. All dry transformers shall have 220°C insulation. 30 kVA units and less shall be designed for 115°C maximum rise in temperature. Transformers larger than 30 kVA shall be designed for 150°C rise in temperature. Maximum temperature at top of enclosure shall not exceed 50°C rise above a 40°C ambient.
- B. Transformers shall have copper windings and shall be K-rated type for non-linear loads, minimum K-factor rating is equals to 13.

2.02 TERMINALS OF TRANSFORMER WINDINGS

- A. Extend from coil for external connection. Provide proper terminal identification.

2.03 NOISE LEVEL

A. Do not exceed following noise level when measured in accordance with NEMA ST 20:

<u>Transformer</u>		<u>Rating</u>	<u>Noise Level</u>
1	to	9 kVA	40 dBA
10	to	50 kVA	45 dBA
51	to	150 kVA	50 dBA

2.04 ENCLOSURES

- A. Dry and Dust-free Indoor Locations: NEMA 1 with ventilated screen.
- B. Damp or Dusty Indoor Locations: NEMA 12, totally enclosed
- C. Outdoor locations: NEMA 3R with drip shield

2.05 FINISH

- A. Thoroughly clean, degrease, and prime metallic surfaces with zinc primer; finish with industrial gray enamel.

2.06 NAMEPLATE

- A. 2-1/2-inch-wide laminated plastic, attached to each transformer by means of stainless-steel rivets or permanent adhesive; show transformer number engraved with 1/2-inch incised white letters on black background.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install dry-type transformers in accordance with NFPA 70 and NEMA criteria and as recommended by manufacturer. Conform to CCR requirements for Seismic Zone 4 location and as specified in Section 26 05 10 - Basic Electrical Materials and Methods.

3.02 GROUNDING

- A. As specified in Section 26 05 26 - Grounding and Bonding.

3.03 FIELD TESTS

- A. Perform field test in accordance with test method recommended by equipment manufacturer and as directed by CITY or its designee.
- B. Verify circuits are connected in accordance with applicable wiring diagrams as indicated.
- C. Verify circuits are continuous and free from short circuits.
- D. Verify insulation resistance to ground of non-grounded conductors is megger

tested to not less than 10 megohms.

- E. Perform tests in presence of CITY or its designee.
- F. Measure primary and secondary voltages for proper tap settings.
- G. Tighten electrical connectors and terminals according to manufacturer's torque tightening values. If manufacture's torque values are not indicated, use those specified in UL 486A and UL 486B.

END OF SECTION 26 05 17

SECTION 26 05 19

INSULATED WIRES AND CABLES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Work specified in this Section consists of furnishing and installing wires and cables as specified and as indicated.

1.02 RELATED SECTIONS

- A. Section 01 33 00: Submittals Procedures
- B. Section 01 43 20: Project Quality Program Requirements

1.03 REFERENCES

A. ASTM International (ASTM):

- 1. ASTM B3 - Soft or Annealed Copper Wire
- 2. ASTM E230 - Standard Specification and Temperature Specification - Electromotive Force (EMF) Tables for Standardized Thermocouples

B. Institute of Electrical and Electronics Engineers (IEEE):

- 1. IEEE 383 - Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations

C. International Cable Engineers Association (ICEA):

- 1. S-61-402 - Thermoplastic-Insulated Wire and Cable
- 2. S-66-524 - Cross-Linked-Thermosetting-Polyethylene Insulated Wire and Cables
- 3. S-68-516 - Ethylene-Propylene-Rubber Insulated Wire and Cable

D. National Fire Protection Association (NFPA):

- 1. NFPA 70 - National Electrical Code (NEC), 2014 edition

E. California Code of Regulations (CCR):

- 1. CCR Title 24, Part 3 - California Electrical Code (CEC)

F. Underwriters' Laboratories, Inc., (UL):

- 1. UL 62 - Flexible Cord and Fixture Wire

G. Conform to codes and regulations of jurisdictional authorities.

1.04 QUALITY ASSURANCE

- A. Comply with Project Quality Program Requirements (see 1.02 above).

1.05 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittals Procedures, for submittal requirements and procedures.
- B. Before installation of wire and cable, submit the following information for each type and size of wire and cable:
 1. Manufacturer of wire and cable.
 2. Number and size of strands composing each conductor.
 3. Conductor insulation composition and thickness in mils.
 4. Average overall diameter of finished wire and cable.
 5. Minimum insulation resistance in megohms per 1000 feet at 20 Deg. C ambient.
 6. Jacket composition and thickness in mils.
 7. Total number of conductors per cable.
 8. Shield materials and thickness.
 9. Conductor resistance and reactance in ohms per 1000 feet at 20 Deg. C ambient.
 10. Conductor ampacity at 20 Deg. C ambient.
 11. Bending radius of cable sizes larger than 1/0.
 12. Cable weight per linear foot.

1.06 DEFINITIONS (Not Used)

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 01 66 00 - Product Storage and Handling Requirements, for general requirements for product delivery storage, and handling procedures.
- B. Provide marking on wire and cable in accordance with referenced standard. Label items with UL approval.
- C. Securely wrap or package each unit to prevent damage; clearly label packaging.
- D. Store wire and cable in secure and dry storage facility.

PART 2 - PRODUCTS

2.01 CABLE

- A. Type - ICEA stranded copper, soft drawn.
- B. Insulation Rating: 600 volts.

2.02 SINGLE CONDUCTOR CABLE

- A. Size 1/0 AWG and Smaller: NFPA 70 Type XHHW, cross-linked-thermosetting-polyethylene-insulated in accordance with NEMA WC7; or NFPA 70 Type RHH, ethylene-propylene-rubber-insulated neoprene, Hypalon or CPE jacketed in accordance with NEMA WC 8.
- B. Size 2/0 AWG and Larger: NFPA 70 Type RHH, ethylene-propylene-rubber-insulated, neoprene, Hypalon or Type CPE. Jacketing shall be in accordance with NEMA WC 8.
- C. Temperature ratings of cables shall be not less than 90°C when used in dry locations.
- D. Power cable for emergency fans and related equipment shall pass flame propagating criteria of IEEE 383 and with minimum circuit time of five minutes in flame test. Type Test certificate is required with every shipment of cables.
- E. Cables shall be jacketed over insulation; where used for lighting cables shall be suitable for installation in cable tray.

2.03 MULTIPLE CONDUCTOR CABLE

- A. Number of Insulated Conductors: As required by application.
- B. Use multiple conductor cable for power applications, except receptacles and for installation in cable tray for sizes up to 4/0.
- C. Insulation: As specified for single conductor cable.
- D. Overall Covering: As specified for single conductor cable.
- E. Multiple conductor for control wire: Minimum No.14 stranded copper, except wiring between CIC compartments where minimum of No. 16 stranded copper may be used.

2.04 BARE CONDUCTOR

- A. ASTM B3, Class B stranded annealed soft-drawn copper conductor, size as indicated. Bare conductor shall be used for ground only.

2.05 THERMOCOUPLE CABLE

- A. Provide thermocouple cable with solid conductors meeting requirements of ANSI MC96.1 and of type compatible with thermocouple leads furnished with motor or temperature sensor. Thermocouple cable shall have flame-retardant insulation,

pairs shall be assembled with left-hand lay, cables shall have flame-retardant outer jacket with overall shield, UL listed as Type PLTC.

2.06 COLOR CODING OF CONDUCTORS

- A. Color code of multiple conductor, 120 VAC control cables - Conform to NEMA WC 5.
- B. Color code power supply cables and branch circuit conductors throughout secondary alternating current (a/c) wiring system as follows:

<u>CONDUCTOR</u>	<u>208/120 VOLTS</u>	<u>480/277 VOLTS</u>
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	White
Ground (Communication)	Green	Green
Ground (Power)	Bare/Green Bare/Green	

- C. Branch circuit phase conductors No. 10 and smaller, neutral and equipment ground conductors shall have solid color insulation or solid color coating.
- D. Phase conductors having colored tracers shall use background color other than white or green.
- E. Solid color coatings and tracers shall be applied using a strongly adherent paint or dye which will not damage the insulation will not fade, and which will not be obliterated by pulling into a conduit or raceway.
- F. Conductors with insulation or individual covering that is green, green with one or more yellow stripes, or otherwise identifies permitted on this section, shall not be used for underground or grounded conductor.

2.07 CABLE SUPPORTS AND FASTENERS

- A. Designed for use with channel inserts. Conform to NFPA 70 and CEC.

2.08 CONDUCTOR BUNDLING STRAPS

- A. Formed from self-extinguishing nylon having a temperature range of – 65 Deg. F to + 250 Deg. F.
- B. Equip straps with locking hub or head with stainless steel locking barb on one end and a taper on another end.
- C. Wire and cable ties for installation outdoors and in exposed locations shall be ultraviolet- resistant nylon.

- D. Tie wraps shall not be used for securing cables in any location where exposed to excessive vibration or movement and in close proximity to the Traction Power System Overhead Catenary System.

PART 3 - EXECUTION

3.01 WIRING

- A. Provide complete as indicated. Provide ample slack wire for motor loops, service connections and extensions. In outlet or junction boxes provided for installation of equipment by others, tape ends of wires and install blank covers. Do not splice wires or cables installed in cable tray. Do not install receptacle and lighting cables in cable tray.

3.02 BENDS

- A. Do not bend cables to radii less than 12 times outside diameter, except where conditions make specified radius impracticable and shorter radii are permitted by NFPA 70 and NEMA WC 7, Appendix N or NEMA WC.8 as applicable.

3.03. BUNDLING OF CABLE AND CONDUCTORS

- A. Bundle cable and conductors neatly and securely with nylon bundling straps when located in branch circuit panel boards, cabinets, control boards, switchgear and motor control centers. Bundle single conductor cables for three-phase and single-phase circuits in cable trays.

3.04. INSTALLATION

- A. Install motor feeders, service connections and extensions in accordance with referenced codes. Install motor feeder in liquid-tight flexible conduit 18 inches minimum length at motor conduit box, longer lengths may be used with CITY or its designee's approval.

3.05 WIRE PULLING

- A. Install wire and cable in conduit as indicated. Do not pull wire into conduit until conduits and pull point boxes have been thoroughly cleaned and swabbed. Do not use block and tackle or other mechanical means for pulling conductors smaller than No. 2 AWG in raceways.
- B. Use suitable installation equipment to prevent cutting and abrasion of conduits and wire during the pulling of feeders. Use lubricant and installation procedure as recommended by cable manufacturer. Pulling tension shall not exceed manufacturer's recommendations.
- C. Use masking or other means to prevent obliteration of cable identification when solid color coating or colored tracers are used.

- D. Pull all cables installed in a single conduit together.
- E. Do not exceed percentage of conduit fill allowed in NFPA 70.

3.06 TRENCHING

- A. Trenches for installation of direct buried cable shall be of uniform shape and free from sharp projections or rocks. Place three-inch layer of fine earth or sand; unreel cable in place along trench and lay on sand or earth. Carefully backfill remainder of trench and tamp on both sides of cable to hold in position. Do not pull cable into trench from a stationary reel. Prevent cable from coming into contact with sharp objects during installation. Provide temporary supports in trench, if necessary, to prevent damage to insulation.

3.07 INSTALL BURIED CABLE IN CONDUIT:

- A. Buried conduits installed beneath the areas subject to traffic or other heavy surface loading, shall be encased in reinforced concrete with a minimum three-inch cover all around.
- B. Concrete for duct bank encasements shall be Class 2000. Where underground duct bank crosses below tracks or equivalent, the top of ducts and cable system structures shall be located at a depth of not less than 4'-0" below top of rail.

3.08 IDENTIFICATION

- A. Provide nonmetallic fiberboard or plastic identification tags or pressure-sensitive labels designed for fastening to cables, feeders and power circuits in vaults, pull boxes, manholes, switchgear and at all terminations.
- B. Stamp or print tags or labels to correspond with markings on Contract Drawings or mark such that feeder or cable can be identified.
- C. If suspended type identification tags are provided, attach tags to slip-free plastic cable lacing units or to nylon bundling straps.
- D. Identify and color code conductors and cables according to Section 26 05 53, Identification of Electrical Systems.

3.09 CONTINUITY AND INSULATION TESTING

- A. Test wires and cables for continuity before termination, splicing or connection to loads. Megger test insulation resistance to ground of non-grounded conductors. 10 megohms is the minimum acceptable insulation resistance.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING AND BONDING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Furnishing, installing, connecting and testing a complete grounding and bonding system as indicated.

1.02 RELATED SECTIONS

- A. Section 01 33 00: Submittal Procedures
- B. Section 01 43 20: Project Quality Program Requirements
- C. Section 01 66 00: Product Storage and Handling Requirements
- D. Section 03 15 13: Water stops
- E. Section 26 05 10: Basic Electrical Materials and Methods
- F. Section 26 05 19: Insulated Wires and Cables
- G. Section 26 08 00: Test Support/Start-Up

1.03 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM B3 - Soft or Annealed Copper Wire
 - 2. ASTM B187 - Copper Bus Bar, Rod, and Shapes
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 70 - National Electrical Code (NEC), 2014 edition.
- C. California Code of Regulations (CCR):
 - 1. CCR Title 24, Part 3 - California Electrical Code (CEC)
- D. Underwriters' Laboratories Inc., (UL):
 - 1. UL 467 - Grounding and Bonding Equipment
 - 2. CA PUC GO - 143B
- E. Conform to codes and regulations of jurisdictional authorities.
- F. Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

G. IEEE 142 Green Book

1.04 QUALITY ASSURANCE

A. Comply with Project Quality Program Requirements (see 1.02 above).

1.05 SUBMITTALS

A. Refer to Section 01 33 00 - Submittal Procedures, for submittal requirements and procedures.

B. Shop Drawings: Show locations of ground rods, grounding connections, locations of embedded and buried grounding conductors, and locations of stub outs and pigtailed for future connections to the grounding system by others. Indicate locations of test points for measurement of grounding resistance.

C. Drawings: Show as-built locations of ground wires to which equipment connections will be made.

D. Manufacturer's product data.

E. Four copies of certified test report of grounding resistance including method of measurement.

F. Test Procedures: As specified in Section 26 08 00 - Test Support/Start-Up.

1.06 DEFINITIONS (Not Used)

1.07 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 01 66 00 - Product Storage and Handling Requirements, for general requirements for product delivery, storage, and handling procedures.

B. Provide marking on grounding cables in accordance with referenced standard. Each item shall be UL labeled.

C. Securely wrap, and package unit to prevent damage. Clearly label packaging.

D. Store grounding cables, exothermic weld kits, tools and accessories in secure and dry storage facility.

PART 2 - PRODUCTS

2.01 GROUNDING AND BONDING EQUIPMENT

A. Conform to UL 467, and as specified.

B. All wiring material and testing method shall comply with the requirements of IEEE 1202 and UL 2196.

2.02 GROUND RODS

- A. Medium carbon steel core, copper clad by molten weld casting process; size 3/4-inch diameter by 10 feet long or as indicated; 13mil (min) copper coating UL listed.

2.03 BARE CONDUCTORS

- A. ASTM B3, Class B stranded annealed copper conductor unless otherwise indicated, size as indicated.

2.04 BUS BAR

- A. ASTM B187, 98 percent conductivity copper, size as indicated.

2.05 SINGLE CONDUCTOR INSULATED WIRE

- A. As specified in Section 26 05 19 - Insulated Wires and Cables. Use insulated ground wire for grounding communication systems only.

2.06 TERMINAL LUGS

- A. As specified in Section 26 05 10 - Basic Electrical Materials and Methods.

2.07 JUMPERS

- A. Tin-plated copper braided flexible jumper.

2.08 GROUND TEST STATION

- A. Precast concrete, 12" x 24" deep open bottom concrete box and concrete cover marked "GROUND" similar to Brooks products #9 or equal.

PART 3 - EXECUTION

3.01 GROUNDING

- A. Ground Connections
 1. Exothermic weld buried and embedded ground connections. Make welds in accordance with manufacturer's requirements. Clean and coat with tar epoxy before backfilling. Compression-type mechanical connector is not acceptable.
 2. The exothermic welding system furnished under this specification shall meet the applicable requirements of IEEE Std. 80 and IEEE Std. 837. Independent test data showing conformance to shall be readily available.
 3. Use for connections to structural steel and underground connections and shall be suitable for exposure of direct burial in earth or concrete without degradation over the lifetime of the grounding system. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable. Manufacturer

- shall be ISO9001 certified similar to Erico Cadweld Plus or equal.
4. For above ground connections, install compression type terminal lugs or mechanical bolted connectors as specified in Section 26 05 10 - Basic Electrical Materials and Methods.
 5. Use continuous ground conductor without splices.
 6. Connect ground bus bars to station ground system as indicated. Provide water stops on ground cable risers, where risers enter structure. See section 03 15 13 – Water stops for requirements.
- B. Ground Rods:
1. Drive ground rods vertically with rod top a minimum two feet below grade or with rod top terminated in gravel filled ground well, as indicated. Use ground rod for main grounding system. If extensive rock formation is encountered, relocate ground rods as directed by CITY or its designee.
 2. Interconnect ground rods longitudinally and laterally with bare copper wire size as indicated.
 3. Interconnect vertical ground risers with bare copper wire size as indicated.
 4. If the ground resistance exceeds 25 ohms, two or more rods connected in parallel spaced at a maximum of twice the length of the longest rod shall be provided to meet grounding resistance requirement.
- C. Equipment Grounding:
1. Ground electrical equipment enclosures in accordance with NFPA 70 requirements.
 2. Connect switchgear, motor control center and Auxiliary Power Transformer ground buses directly to station ground, using ground cable, size as indicated, but not less than No. 4/0.
 3. Ground frames of motors to NEC sized equipment grounding conductor carried in power conduit.
 4. Transformers - Ground non-current-carrying metal enclosure with conductor sized as indicated or as required by NFPA 70.
 5. Surge Arresters in Auxiliary Power Transformer enclosure. Provide a separate 500 KCM ground wire for grounding surge arresters directly to the ground grid. Insulate this cable from enclosure.
 6. All grounding wires shall be as indicated and sized to provide adequate conduction path for all possible ground faults and electrical interference currents.
- D. Ground metallic conduits, raceways, trench ducts, cable trays, boxes, cabinets, panel boards, disconnect switches, exposed expansion joints, lighting fixtures, receptacles, steel door frames, handrails, and steel stairs in accordance with NFPA 70.
- E. Ground outdoor light standards to station main ground grid, using No. 6 ground conductor. Install ground rod in each pole and bond to main ground grid system.
- F. Install grounding grid, plates and reference ground test plate in incoming service room as indicated.
- G. Provide independent ground in incoming service room as indicated.

3.02 FIELD QUALITY CONTROL AND TESTS

- A. Submit test procedures in accordance with Section 26 08 00 - Test Support/Start-Up.
- B. In the presence of CITY or its designee, test the grounding system by the fall-of-potential method demonstrating total ground system resistance does not exceed five ohms except the instrument grounding (insulated) system, which does not exceed three ohms. To meet this resistance requirement, if necessary, install additional ground rods.
- C. Test equipment enclosures, conduit, raceways, trench ducts, cable trays, exposed expansion joints, lighting fixtures, receptacles, light standards steel door frames, handrails, steel stairs and substation fencing for continuity to the ground system.
- D. Perform ground resistance test at different stages of construction on ground grids as installation work progresses. No equipment or device ground connection shall be made before ground grid resistance test is complete.
- E. Do not exothermically weld the station ground grid to the invert slab rebars for the purpose of meeting the two-ohms ground resistance criteria.
- F. Provide ground resistance curves for Fall-of-potential method and other methods as required.
- G. Provide ground resistance reading of all grounded equipment and auxiliaries to ensure that they are properly grounded.

END OF SECTION 26 05 26

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. The Work of this Section consists of furnishing and installing identification for raceway, boxes, panelboards, switchboards and all power and communication distribution equipment including conductors for communication and control cable.

1.02 RELATED SECTIONS

- A. Section 01 33 00: Submittal Procedures
- B. Section 01 43 20: Project Quality Program Requirements
- C. Section 26 05 10: Basic Electrical Materials and Methods

1.03 REFERENCES

- A. American National Standards Institute (ANSI)
 - 1.ANSI A13.1 Scheme for the Identification of Piping Systems
 - 2.ANSI C2 National Electrical Safety Code (NESC)
- B. National Fire Protection Agency (NFPA)
 - 1.NFPA 70 National Electrical Code (NEC), 2014 edition.

1.04 QUALITY ASSURANCE

- A. Comply with Project Quality Program Requirements (see 1.02 above).

1.05 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures, for submittal requirements and procedures.
- B. Product Data: Submit manufacturer catalog cut sheets for each electrical identification product indicated.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.
- D. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

- E. Shop drawings of tags and terminations for each method.
- F. Tagging and termination procedures, as required.

1.06 DEFINITION (Not Used)

1.07 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 RACEWAY AND BOXES

- A. Comply with ANSI A13.1, Table 3 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Color for Printed Legend:
 - 1. Power Circuits: Black letters on an orange field.
 - 2. Legend: Indicate system or service and voltage.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.02 CONDUCTOR AND COMMUNICATION AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit

identification legend machine printed by thermal transfer or equivalent process.

- C. Write-On Tags: Polyester tag, 0.015-inch-thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
- D. Medium voltage cable tag: laminated Micarta type, 5" x 3½", nameplates engraved with 5/32-inch high white letters on black background.
- E. Provide tags on pull rope of spare conduits showing starting point and end point of spare conduits.

2.03 UNDERGROUND-LINE WARNING TAPE

- A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.
 - 1. Not less than 6 inches wide by 4 mils thick. Color coded for electric lines (red) and for communication lines (orange).
 - 2. Warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall be "CAUTION - BURIED ELECTRIC (or COMMUNICATION) LINE BELOW", or similar wording.
 - 3. Compounded for permanent direct-burial service. Code and letter coloring shall be permanent, unaffected by moisture and other substances contained in trench backfill material
 - 4. Embedded continuous metallic strip or core.

2.04 WARNING LABELS AND SIGNS

- A. Comply with CEC and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Metal-Backed, Butyrate Warning Signs: For all outdoor equipment. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.
- D. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: For equipment rated up to 600V "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES." Change to 60" for equipment rated

PROTECTIVE COVERS

13130-46

above 600V and up to 15KV, or as per code requirements.

3. High Voltage Equipment Warning "DANGER - HIGH VOLTAGE - KEEP OUT".
4. Provide other warning labels and signs as required.
5. Furnish Warning labels in accordance to NFPA 70E and National Electrical Code for Arc Flash Hazard Warning.

2.05 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16-inch-thick for signs up to 20 sq. in. and 1/8-inch-thick for larger sizes.
 1. Engraved legend with black letters on white face.
 2. Punched or drilled for mechanical fasteners.
 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.06 EQUIPMENT IDENTIFICATION LABELS

- A. Equipment Identification: Engraved laminated-plastic nameplate mounted with corrosion-resistant screws.
- B. Labels shall include the following information in minimum 1/4" letters except designation which will be in 3/8" letters. Color of nameplate shall be black for equipment connected to normal power, red for equipment connected to emergency power, and blue for equipment connected to Un-interruptible Power Supply. Color of letters shall be white.
 1. Panel or equipment designation
 2. Rating: Volt, Amps, No. of phase and wires, horsepower, etc.
 3. AIC Rating (RMS Symmetrical Amps)
 4. Fed from information
 5. Manufacturer S.O. number
 6. Date of Installation
- C. For medium voltage switchgear:
 1. Use 1" to identify equipment designation
 2. Use 3/4" to identify voltage rating and source
 3. Use 1/2" to identify individual feeder breakers and buckets
 4. Use 1/4" to identify control switches, indicating lights, and other miscellaneous devices on the bucket door.
- D. Adhesive labels and nameplates are not acceptable.

2.07 WIRING DEVICES

- A. Identify wiring devices with clear vinyl polyester tape with black lettering, red lettering for emergency power. Labels shall be printed, flexible, self-adhesive type.
- B. Receptacle label shall include panel designation and circuit number.
- C. For receptacles other than 20A, 120V, labels shall include receptacle voltage, phase and amperage at top of receptacle and panel designation and circuit numbers at bottom of receptacles.

2.08 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength: 50 lb., minimum.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black, except where used for color-coding.
- B. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

PART 3 EXECUTION

3.01 APPLICATION

- A. Raceways and Duct Banks More Than 600 V Concealed within Buildings: Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch-high black letters on 20-inch centers.
- B. Accessible Raceways More Than 600 V: Identify with "DANGER-HIGH VOLTAGE" in black letters at least 2 inches high, with self-adhesive vinyl labels. Repeat legend at 10- foot maximum intervals, in congested areas and 20-foot intervals in straight runs.
- C. Accessible Raceways, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 50A: Identify with orange self-adhesive vinyl label showing voltage.
- D. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands:
 - 1. Fire Alarm System: Red.
 - 2. Fire-Suppression Supervisory and Control System: Red and yellow.
 - 3. Combined Fire Alarm and Security System: Red and blue.
 - 4. Security System: Blue and yellow.
 - 5. Mechanical and Electrical Supervisory System: Green and blue.
 - 6. Telecommunication System: Green and yellow.

7. Control Wiring: Green and red.

- E. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in indoor pull and junction boxes, use color coding conductor tape and marker tape unless otherwise noted. For conductors in underground vaults, manholes, and handholes use write-on tags unless otherwise noted. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
- F. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use marker tape. Identify each ungrounded conductor according to source and circuit number.
- G. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit numbers in each cabinet, pull and junction box and outlet box. Color coding may be used for voltage and phase identification.
- H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
- I. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground- line warning tape 12 inches above power and communication duct bank during trench backfilling for exterior underground power, control, signal and communication lines.
- J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
 - 1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
 - 2. Equipment Requiring Workspace Clearance According to latest edition, NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- K. Instruction Signs:
 - 1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install

- instruction signs with approved legend where instructions are needed for system or equipment operation.
2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer and load shedding
- L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Equipment: Engraved, laminated plastic, screwed on type. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high. Nameplates for switchboards, transformers, MCC, panel boards shall be minimum of 2-inch-high by 4 inch wide.
 - b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 2. Equipment to Be Labeled:
 - a. Panelboards, electrical cabinets, and enclosures.
 - b. Access doors and panels for concealed electrical items.
 - c. Electrical switchgear and switchboards.
 - d. Transformers.
 - e. Unit substations.
 - f. Motor-control centers.
 - g. Disconnect switches.
 - h. Enclosed circuit breakers.
 - i. Motor starters.
 - j. Push-button stations.
 - k. Contactors.
 - l. Remote-controlled switches, dimmer modules, and control devices.
 - m. Fire-alarm control panel and annunciators.
 - n. Monitoring and control equipment.
 3. Equipment to be labeled/identified with special embossed, non-skid pattern.
 - a. In-ground concrete pullbox steel plate cover
 - b. Manhole/handhole

3.02 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device. Use only where permitted.
- E. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 20-foot maximum intervals in straight runs, and at 10-foot maximum intervals in congested areas.
- G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for feeder and branch-circuit conductors.
 - 1. Colors for 208/120-V Circuits:
 - a. Phase – A - Black
 - b. Phase – B - Red
 - c. Phase – C - Blue
 - d. Neutral: White
 - e. Ground: Green
 - 2. Colors for 480/277-V Circuits:
 - a. Phase A: Brown
 - b. Phase B: Orange
 - c. Phase C: Yellow
 - d. Neutral: Grey
 - e. Ground: Green
 - 3. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 12 inches below finished

grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

- I. Tag all cables furnished and installed: Terminate each conductor at each end unless otherwise indicated on the Contract Drawings or as directed. Cross connect all pairs, including spare pairs, as directed. Tag all special circuit pairs. Make all tagging, wiring and equipment changes required and remove and/or furnish and install all material and equipment required for such changes.
- J. Furnish and install all wire terminals, wire and cable tags, and all apparatus, equipment and miscellaneous material required.
- K. Furnish, mark and install all temporary tags which are required to properly tag all temporary wires and cables used in the Work. Remove temporary tags upon completion of the Work.

END OF SECTION 26 05 53

SECTION 26 08 00

TEST SUPPORT/START-UP

PART 1 - GENERAL

SECTION INCLUDES

- A. Providing test support personnel and equipment for electrical system tests required by other Sections and to verify compliance with specified performance.

RELATED SECTIONS

- A. Section 01 33 00: Submittal Procedures
- B. Section 01 60 00 System Safety and Assurance
- C. Section 01 43 20 Project Quality Program Requirements

1.02 QUALITY ASSURANCE

- A. Comply with Project Quality Program Requirements (see 1.02 above).
- B. Furnish a written notice CITY or its designee at least 48 hours in advance before the installed systems will be ready for testing. CITY or its designee may witness tests and test procedures.
- C. CITY or its designee may opt to choose a manufacturer's representative be present to witness tests and verify test results of the contractor and CITY furnished equipment's installed under this Contract.

1.03 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures, for submittal requirements and procedures.
- B. Submit test schedule and test procedures prepared by Contractor for acceptance 30 days prior to testing of systems. Each procedure shall contain following:
 - 1. Statement of procedure objective and scope.
 - 2. List of equipment required to set up and perform procedure.
 - 3. List of equipment or services required from areas outside Contractor's responsibility.
 - 4. List of prerequisite tests to be completed before procedure can be performed.
 - 5. Description of required procedure setup, including diagrams illustrating test equipment connections and identifying test points, where applicable.
 - 6. Step-by-step instructions for performing procedure identifying points where

data is to be recorded and limits for acceptable results.

7. Provisions for recording pertinent test conditions and environment at time of test.
8. Instructions for recording data on data sheets and verifying that procedure steps have been completed.

C. Results of tests performed on installed systems.

D. Instrument list and certification indicating instruments used for testing have been calibrated and accuracy certified within the previous year minimum, or the period recommended by the manufacturer. List types of instruments used, manufacturer, serial number, latest date of calibration, and calibration organization.

E. Parameters to be recorded:

1. Keep reproducible test data sheets showing results of tests described in CITY approved test procedures. Provide reproducible data sheets listing acceptable or specified test limits and values actually measured. Maintain one copy of test data sheets on Worksite. Furnish one copy to CITY. Retain one copy. Provide data sheets showing test set-up, equipment used, names of persons performing test, names of witnesses, data sheets – Reviewed by number of equipment under test. Test data sheets – Reviewed by CITY or its designee and approved as submitted, or additional tests may be required. If additional tests are required because initial test results do not comply with specifications on Contractor furnished document retest and submit as before at no additional cost to CITY.

1.04 DEFINITIONS (NOT USED)

1.05 PARAMETERS TO BE RECORDED

- A. Keep hardcopy of test data sheets showing results of tests as described in CITY-approved test procedures.
- B. Provide reproducible data sheets listing acceptable or specified test limits and values actually measured. Maintain one copy of test data sheets on Worksite. Furnish one copy to the CITY. Retain one copy in the Project File with the contractor.
- C. Provide data sheets showing test set-up, equipment used, names of persons performing test, names of witnesses, date, location, and serial number of equipment under test.
- D. Test data sheets will be reviewed by the CITY or its designee and approved as submitted or additional tests may be required. If additional tests are required because initial test results do not comply, retest and submit as before at no additional cost to CITY.

1.06 SAFETY AND PRECAUTIONS

- A. Practice worksite Safety at all the times, see Section 01 60 00.
- B. Contractor shall perform all the prerequisite procedure prior to performing testing.
- C. Contractor's shall be responsible to make sure that the test location, installed equipment and components are thoroughly clean, inspected and free of any material such as metal shavings, wires cutting, etc. before testing or energizing.
- D. Any system, material or workmanship which is found defective on the basis of electrical tests shall be reported directly to CITY. Contractor or its subcontractor shall fix or replace defective item before proceeding with the test at no additional cost to CITY.

PART 2 - PRODUCTS

2.01 PROVIDE TEST PROCEDURES

- A. Provide test procedures, qualified technical personnel, tools, test instruments and other items required to perform testing. CITY may have qualified witnesses present at each test to observe test and certify recorded results.
- B. For extended coverage, provide qualified technical support personnel, tools, test instruments, and services on demand when given at least a 24-hours notice.
- C. When requested by CITY, be present at tests performed by others.
 - 1. Verify interface parameters sought are in compliance with Contractor-provided test data sheets approved by CITY or its designee.
 - 2. Perform work as necessary to ensure accepted interface parameters are met.
- D. CITY will provide test procedures for mechanical equipment controlled from off-site Operations Control Center under Division 23 Mechanical.

PART 3 – EXECUTION

3.01 GROUNDING SYSTEMS VERIFICATION

- A. Verify that grounding system is installed and test in accordance with Contract Documents; resistance to earth shall not exceed two ohms.

3.02 NOT USED

3.03 NOT USED.

3.04 NOT USED

3.05 NOT USED

3.06 NOT USED.

3.07 NOT USED

3.08 NOT USED.

3.09 LIGHTING AND RECEPTACLE SYSTEM OPERABILITY

- A. Verify by testing operability of outdoor lighting, lighting, lighting controller, sensors and receptacle circuits.

3.10 AUXILIARY ELECTRICAL EMERGENCY POWER SYSTEM

- A. Verify by testing operability of auxiliary electrical emergency power system (uninterruptible power system) in accordance with Contract Documents and specifications.

3.11 VERIFICATION OF SERVICE TO AND CONTROL OF ILLUMINATED SIGNS

- A. Verify by testing that power is available and control circuits are operational for illuminated signs, i.e. emergency exit signs

3.12 NOT USED

3.13 NOTUSED.

END OF SECTION 26 08 00

SECTION 26 09 23

LIGHTING CONTROLS AND INSTRUMENTATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Furnishing and installing an integrated, energy saving system, lighting control equipment, instrumentation, and wiring for a single supplier the items listed below:
 - 1. Lighting Control Panel
 - 2. Occupancy Sensors
 - 3. Terminal blocks
 - 4. Astronomic time clocks
 - 5. Daylighting Controls
 - 6. Photocell
- B. Contractor is responsible for conforming that the panels and sensors interoperate as a single system.

1.02 RELATED SECTIONS

- A. Section 01 33 00: Submittal Procedures
- B. Section 01 43 20: Project Quality Program Requirements
- C. Section 01 78 23: Operation and Maintenance Data
- D. Section 26 05 10: Basic Electrical Materials and Methods

1.03 REFERENCES

- A. Lighting control panel shall be tested, and UL listed under the UL 916 Energy Management Equipment standards and controlling emergency circuits shall be ETL listed to UL 924.
- B. Astronomic time clocks, terminal blocks and photoelectric switches shall be UL listed.
- C. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA ICS 4 - Terminal Blocks for Industrial Use
- D. The control system shall comply with all applicable National Electric Code, latest code (NEC) regarding electrical wiring standards.
- E. 2013 Building Energy Efficiency Non-Residential

1.04 QUALITY CONTROL

- A. Comply with Project Quality Program Requirements.
- B. The lighting control system shall be listed, approved and comply as required with all national, state and local energy codes to include but not limited to California Title 24 ASHRAE 90.1-2004.

1.05 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures, for submittal requirements and procedures.
- B. Complete manufacturer's descriptions, catalog data and information on:
 - 1. Relay panels
 - 2. Control relays
 - 3. Switches
 - 4. Digital Time clocks
 - 5. Occupancy Sensors
 - 6. Photocells.
- C. Manufacturer's written installation instructions including descriptions, required installation equipment, procedures to be followed and precautions to be observed.
- D. Operating and maintenance data as specified in Section 01 78 23 - Operation and Maintenance Data.
- E. Test Procedures.

1.06 DEFINITIONS (Not Used)

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Lighting Control Panel: Watt stopper / Legrand; LC&D; approved equivalent. Manufacturers shall have a minimum of five (5) years' experience in control systems. Control systems that require custom assembly and sizing shall not be acceptable.

2.02 LIGHTING CONTROL PANELS (LCPs)

- A. Relay Panels:
 - 1. All LCPs shall be in NEMA Type rated enclosure with screw cover or hinged Locking door. Furnish NEMA rated types as applicable per code.

2. A barrier shall separate the high voltage and low voltage compartments of the panel and separate 120v and 277v.
3. LCP input power shall be capable of accepting 120v or 277v without rewiring.
4. Control electronics in the low voltage section shall be capable of driving 2 to 48 relays (rated as per Section 2.1.3), control any individual or group of relays, provide individual relay overrides, provide a master override for each panel, store all programming in non-volatile memory, after power is restored return system to the correct state for time of day, provide programmable dual blink warn timers for each relay or zone of relays, and be able to control Normally Open Latching (NOL) or Normally Closed Latching (NCL) relays.
5. Lighting control system shall be digital and consist of a Master LCP, Remote LCPs, if required. All system components shall connect and be controlled via Category 5, 4 twisted pair cable with RJ45 connectors, providing real time two-way communication with each system component. Analog systems are not acceptable.

B Standard Output Relays

1. UL Listed 30 Amp at 277VAC 1480 and 20 Amp Tungsten at 120 Vac. 347V Ballast and HID at 20 amps Latching Relay with 18,000A SCCR at 277Vac,
2. Relays shall be individually replaceable. Relay terminal blocks shall be capable of accepting minimum two (2) #8AWG wires on both the line and the load side. Systems that do not allow for individual relay replacement or additions are not acceptable. Relays to be rated for 250,000 operations minimum at a full 30A lighting load. Standard relay shall default to closed at normal power loss, Normally Closed Latching (NCL).
3. Optional relay types available shall include: Normally Open Latching (NOL) relay rated for 250,000 operations, a 600v 2-pole NO and NC and a Single Pole, Double Throw (SPDT) relay.

C. Switches

1. Keyed switches shall be similarly programmable and connect to the lighting control system bus.
2. Digital switches for high abuse areas (common areas, platforms, etc.) shall be vandal resistant, contain no moving parts, and be touch sensitive and available with up to two buttons in a single gang. Multi gang versions shall also be available. Touch pads shall be Stainless Steel and capable of handling both high abuse and wash down locations. High abuse switches shall connect to the lighting control system digital bus. Each high abuse touch button shall be able to be programmed in the same way as other digital switch buttons. Switches must be capable of handling electrostatic discharges of at least 30,000 volts (1cm spark) without any interruption or failure in operation.

D. DTC - Digital Time Clock

1. A Digital Time Clock (DTC) shall control and program the entire lighting control system and supply all time functions and accept modem (RS232) inputs.

2. DTC shall be capable of up to 32 schedules. Each schedule shall consist of one set of On and Off times per day for each day of the week and for each of two holiday lists. The schedules shall apply to any individual relay or group of relays.
3. The DTC shall be capable of controlling digital devices at up to 127 addresses on a single bus and capable of interfacing digitally with other buses using manufacturer supplied interface cards.
4. The DTC shall accept control locally using built in button prompts and use of an 8 line 21-space display or from a computer or modem via an on-board RS 232 port. All commands shall be in plain English. The DTC shall be run from non-volatile memory so that all system programming is retained indefinitely and time of day is battery backed for up to 10 years.
5. System shall come with a pre-Installed modem that allows for remote programming from any location using a PC and free remote-control software.
6. DTC shall provide system wide timed overrides. Any relay, group or zone that is overridden ON, before or after hours, shall automatically be swept OFF by the DTC a maximum of 2 hours later.

E. Photocells:

1. Photocells to be mounted in location indicated on the plans. Photocells used for exterior lights shall provide multiple trip points from 1 roof mounted unit. All trip points shall be able to be changed remotely via Internet or dial up modem. Photocells requiring manual trip point adjustment are not acceptable. Photocell used for interior lighting control shall have multiple settings such as start-point, mid-point, off-point, fade-up, fade-down, etc. All settings shall be remotely accessible and adjustable. Systems providing local adjustment only are not acceptable. Photocells to be certified to comply with the current energy code covering this project at time of submittal of plans for building permit.

F. Interfaces:

1. A dry contact input interface card that provides 14 programmable dry contact closure inputs. Use shielded cable to connect input devices to interface card on runs over 200 feet.

PART 3 - EXECUTION

3.01 EQUIPMENT INSTALLATION

- A. Mount replay control cabinets adjacent to respective lighting panel board. Cabinet shall be surface or flush mount, per plans. Wiring between relay control cabinets and panels boards shall be in accordance with local codes and acceptable industry standards. Under no circumstances will any extra payment be authorized for Contractor due to Contractor's lack of knowledge or understanding of any and all prevailing codes or specified manufacture's installation requirements. Neatly lace and rack wiring in cabinets. During construction process, protect all interior components of each relay panel and each digital switch from dust and debris Any

damage done to electronic components due to failure to protect them shall be the sole responsibility of the installing contractor.

B. Switches

1. Provide outlet boxes, single or multi-gang, as shown on the plans for the low voltage digital switches. Mount switches as per plans. Supply faceplates per plans and specifications. Contractor is specifically responsible to supply and install the required low voltage cable, Category 5, 4 twisted pair, with RJ45 connectors (commonly referred to as Cat 5 patch cable) between all switches and panels. Field- test all Cat 5 patch cable with a recognized cable tester. All low voltage wire to be run in conduit, per local codes.

C. Crimping Kit:

1. Manufacturer to provide on all systems of more than 2 panels a crimping kit with sufficient approved EZ Brand RJ 45 connectors to populate the whole system. A simple manual that shows all the pitfalls of crimping RJ 45s and how to do it right must be both provided and read by the installing contractor.

D. Wiring:

1. Do not mix low voltage and high voltage conductors in the same conduit. No exceptions.
2. Ensure low voltage conduits or control wires do not run parallel to current carrying conduits.
3. Place manufacturer supplied "terminators" at each end of the system per bus manufacturer's instructions.
4. Plug in Category 5 patch cable with RJ45 end connector that has been field-tested with a recognized cable tester, at the indicated RJ45 connector provided at each lighting control device, per manufacturer's instructions.
5. Use Category 5 patch cable for all system low voltage connections. Additional conductors may be required to compensate for voltage drop with specific system designs. Use shielded cable for dry contact inputs on runs over 200 feet.
6. Do not exceed 4000ft-wire length for the system bus.
7. All items on the bus shall be connected in sequence (daisy chained). Star and spur topologies are not acceptable are not acceptable.
8. The specified lighting control system shall be installed by the electrical Contractor who shall make all necessary wiring connections to external devices and equipment, to include photocell. Contractor to wire per manufacturer instructions.

3.02 DOCUMENTATION

- A. Each relay shall have an identification label indicating the originating branch circuit number and panelboard name as indicated on the drawings. Each line side branch circuit conductor shall have an identification tag indicating the branch circuit

number.

- B. Provide a point-to-point wiring diagram for the entire lighting control system. Diagram must indicate exact mounting location of each system device. This accurate "as built" shall indicate the loads controlled by each relay and the identification number for that relay, placement of switches and location of photocell. Original to be given to CITY, copies placed inside the door of each LCP.

3.03 SERVICE AND SUPPORT

- A. Start Up: After system has been installed, contact manufacturer at least 7 days before turnover of project and secure services of factory trained manufacturer's representative to verify proper operation of system components. Contractor will remotely dial into the lighting control system, run diagnostics and confirm system programming. Contractor shall be available at the time of dial in to perform any corrections required by manufacturer. Contractor is responsible for coordinating with CITY the installation of a dedicated telephone line or a shared phone line with an automatic Fax/Modem switch. Phone jack to be mounted within 12 inches of Master LCP. Label jack with phone number. Connect phone line from jack to Master LCP.
- B. Telephone factory support shall be available at no additional cost to the Contractor or CITY both during and after the warranty period. Factory to pre-program the lighting control system per plans and approved submittal, to the extent data is available. The specified manufacturer, at no added cost, shall provide additional remote programming via modem as required by the Contractor or CITY for as long as a phone line is available for the life of the system. Upon request manufacturer to provide remote dial up software at no added cost to CITY. No exceptions.

3.04 TESTING AND ACCEPTANCE

- A. Perform in accordance with the manufacture's recommendations.
- B. Upon completion of installation, conduct an operating test to show that equipment operates in accordance with requirements of this section.
- C. Test for full range of dimming range capability. Observe for visually detectable flicker over full dimming range.
- D. Test occupancy sensors for proper operation. Observe for light control over entire area being covered.
- E. Program lighting control panels per schedule on drawings.
- F. Upon completion of the installation, the system shall be commissioned by the manufacturer's factory-authorized technician who will verify all adjustments and sensor placements.

3.05 CLEANING

A. Perform final cleaning in accordance with Section 01 74 00, Cleaning.

END OF SECTION 26 09 23

SECTION 26 28 16

ENCLOSED CIRCUIT BREAKERS AND PANELBOARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Furnishing, installing, connecting and testing of circuit breakers, panelboards and load centers.

1.02 RELATED SECTIONS

- A. Section 01 33 00: Submittal Procedures
- B. Section 01 43 20: Project Quality Program Requirements
- C. Section 01 66 00: Product Storage and Handling Requirements
- D. Section 01 78 23: Operation and Maintenance Data
- E. Section 26 05 10: Basic Electrical Materials and Methods
- F. Section 26 05 19: Insulated Wires and Cables
- G. Section 26 05 26: Grounding and Bonding
- H. Section 26 08 00: Test Support/Start-Up

1.03 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM B187 - Copper, Bus Bar, Rod, and Shapes and General-Purpose Rod, Bar, and Shapes
- B. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches
 - 2. NEMA PB 1 - Panelboards
 - 3. NEMA 3R - Panelboard Enclosure
- C. National Fire Protection Association (NFPA):
 - 1. NFPA 70 - National Electrical Code (NEC), latest edition.
- D. California Code of Regulations (CCR):
 - 1. CCR Title 24, Part 3 - California Electrical Code (CEC)
- E. Underwriters' Laboratories, Inc., (UL):

1. UL 50 - Enclosures for Electrical Equipment
2. UL 67 - Panelboards

1.04 QUALITY CONTROL

- A. Comply with Project Quality Program Requirements.
- B. Components of the same type, size, rating, functional characteristics and make shall be interchangeable.
- C. Seismic Criteria -Mechanical and Electrical components and their supports shall satisfy the Seismic Design Requirements of California Code of Regulation (CCR) Title 24, Part 2 - Chapter 16 and Chapter 13 of ASCE 7, and as specified in Section 26 05 10 – Basic Electrical Materials and Methods.

1.05 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures, for submittal requirements and procedures.
- B. Shop Drawings and Manufacturer's Literature:
 1. Equipment numbers shown on Contract Drawings
 2. Manufacturer's model number and item identification.
 3. UL listing and rating.
 4. Critical dimensions and mounting arrangement.
 5. Complete replacement parts list.
 6. Enclosed circuit breaker submittals shall show intended circuit, voltage ratings, current rating and interrupting ratings.
 7. Panelboards and load centers submittals shall show arrangement, and identification of each circuit breaker in accordance with reference standards.
- C. Enclosure submittals shall include drawings showing materials and methods of construction, door arrangement, conduit hub and knockout locations, and identification of panelboard or load center.
- D. Four copies of reports of factory and field tests performed in accordance with referenced standards and specified requirements.
- E. Maintenance Data and Operating instructions in accordance with Section 01 78 23 - Operation and Maintenance Data.
- F. Test Procedures: In accordance with Section 26 08 00 - Test Support/Start-Up.

1.06 DEFINITION (Not Used)

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 01 66 00 – Product Storage and Handling Requirements, for general requirements for product delivery, storage, and handling procedures.
- B. Mark each circuit breaker, panelboard and load center in accordance with reference standard. Each item shall be UL labeled.
- C. Securely wrap and package each unit to prevent damage. Clearly label packaging.
- D. Store circuit breakers, panelboards and load centers in secure and dry storage facility.

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. Enclosed Circuit Breakers shall be of same Manufacturer as panelboards or load centers, meeting NEMA AB 1, molded case quick-make, quick-break, bolt-on type, with thermal-magnetic type overload trip, interchangeable unit for frame rated 125 amperes and above, with following parameters:

- 1. Number of poles.
- 2. Rated voltage and continuous current.
- 3. Rated interrupting current.
- 4. Trip setting.

- B. Panelboards and Load Centers shall meet NEMA PB 1, UL 67, with following requirements:

- 1. Enclosure shall meet UL 50, NEMA 3R, NEMA 12, fabricated from galvanized steel, surface- mounted and tamper-proof:

a. Gutter size:

<u>MAIN BUS</u>	<u>END GUTTER</u>	<u>SIDE GUTTER</u>	<u>RATING</u>
<u>AMPERES</u>	<u>SIZE INCHES</u>	<u>SIZE INCHES</u>	
225 and below	6	5	
400 and over	8	8	

- b. Mount interior components on back plate/frame of reinforced steel for rigid support and accurate alignment.
- c. One flat key tumbler cylinder-type nickel-plated door lock.
- d. Provision for enclosure grounding.
- e. Finish: Thoroughly clean, degrease and prime metallic surface with zinc primer; finish with industrial gray enamel.
- 2. Bus Bar shall be 98 percent conductivity copper per ASTM B187, with silver-plated contact surface, meeting the following requirements:
 - a. Neutral bus of same rating as phase bus.

- b. Main lugs or main circuit breaker of rating as indicated.
- c. Furnish grounding bus.
- 3. Provide identification of each system phase conductor in each panelboard in accordance with NEC code.
- 4. Circuit breakers shall be in accordance with the above requirements. Provide 10 handle locks for each size breaker provided for maintenance lockout.
- 5. Nameplate: 2-1/2-inch-wide laminated plastic, attached to each panelboard and load center with stainless steel rivets or permanent adhesive; engrave with panelboard number in 1/2-inch white letters on black background.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install panelboards and load centers with top six feet six inches above floor and bottom not less than 12 inches above floor, unless otherwise required by installation situation and approved by CITY or its engineer. Use multi-sectional panelboards and load centers to meet spacing if necessary. Line up tops of trims to present neat appearance.
- B. Mount panelboards and load centers in place with front straight and plumb and in accordance with CCR requirements for Seismic Zone 4 location and as specified in Section 26 05 10 - Basic Electrical Materials and Methods.
- C. If a feeder serves more than one panel board or panelboard section, install a separate junction box or provide adequate gutter area for termination of feeders and bus taps.
- D. Connect branch circuit wires as required. Connect neutral wire of branch circuit to neutral bar in source panelboard for that circuit.
- E. Install load centers and single enclosed breakers as required.
- F. Make conduit connections as specified in Section 26 05 10, Basic Electrical Materials and Methods.
- G. Make cable connections as specified in Section 26 05 19 - Insulated Wires and Cables.
- H. Ground panelboards and load centers as specified in Section 26 05 26, Grounding and Bonding.
- I. Protect equipment from dust accumulation inside during construction. Clean parts and components as recommended by manufacturer.

3.02 DIRECTORY OF CIRCUITS

- A. Furnish panelboards and load centers with typewritten circuit directory located on inside of enclosure. Cover directory with clear plastic.

3.03 FIELD QUALITY CONTROL

- A. Perform field test in accordance with test method as specified in Section 26 08 00 - Test Support/Start-Up, including trip settings of circuit breakers, and as directed by the CITY or its designee.
- B. Conform to NFPA 70 and to codes and regulations of jurisdictional authorities.
- C. Perform following tests in presence of CITY or its designee and furnish certified report to CITY or its designee. Furnish equipment required to perform tests.
 - 1. Verify that circuits are connected in accordance with wiring diagram.
 - 2. Test and verify insulation resistance to ground of non-grounded conductors is minimum 10 megohms.
 - 3. Test panelboard and load center enclosures for continuity to grounding system.
 - 4. Test operation of circuits and controls. When testing, operate each control a minimum of 10 times and each circuit continuously for a minimum of 1/2 hour.

END OF SECTION 26 28 16

SECTION 26 50 00

LIGHTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Furnishing, installing and testing lighting fixtures, mounting hardware, lamps and accessories as indicated; Exterior Lighting, for outdoor requirements.

1.02 RELATED SECTIONS

- A. Section 01 33 00: Submittal Procedures
- B. Section 01 43 20: Project Quality Program Requirements
- C. Section 01 66 00: Product Storage and Handling Requirements
- D. Section 01 78 23: Operation and Maintenance Data
- E. Section 26 08 00: Test Support/Start-Up
- F. Section 26 09 23: Lighting Controls and Instrumentation
- G. Section 26 52 00: Tunnel Exterior Lighting
- H. Section 26 56 00: Exterior Lighting

1.03 REFERENCES

- A. Aluminum Association, Incorporated (AA): 1. AA46 - Anodized Architectural Aluminum
- B. American National Standards Institute (ANSI):
 - 1. ANSI C64.41 - IEEE Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits
 - 2. ANSI C78 Series - Electric Discharge Lamps (Fluorescent), Electric Discharge Lamps, High-Intensity Discharge Lamps/Fluorescent Lamp Auxiliaries
 - 3. ANSI C81.61 - Electric Lamp Bases
 - 4. ANSI C82 - Series Lamp Ballasts and Transformers
- C. ASTM International (ASTM):

1. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 2. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 3. ASTM A1008 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
- D. California Code of Regulations (CCR):
1. CCR Title 8 - General Industry Safety Orders
 2. CCR Title 24 - Part 3, California Electric Code (CEC)
 3. CCR Title 24 - Regulations for the Accommodations of the Disabled (RAD) Energy Conservation Requirements
 4. CCR - Building Energy Efficiency Standards, Latest Edition
- E. Federal Communications Commission (FCC):
1. FCC - Rules and Regulations, Part 18
- F. Federal Specifications (FS):
1. FS TT-P-641 Primer Coating, Zinc Dust-Zinc Oxide (for Galvanized Surfaces) Lamp Efficiency Energy Policy Act of 1992 Standards
- G. Illuminating Engineering Society of North America (IESNA)
- H. National Fire Protection Association (NFPA):
1. NFPA 70 - National Electrical Code (NEC)
- I. Non-Residential Manual Compliance with the 1992 Energy Efficiency Standards. (California Energy Commission)
- J. Porcelain Enamel Institute (PEI)
1. PEI 1001 - Specification for Architectural Porcelain Enamel on Steel for Exterior Use
 2. PEI 803 Recommended Specification for Architectural Porcelain Enamel on Aluminum for Exterior Use
- K. Underwriters' Laboratories, Inc. (UL):
1. UL 153 - Portable Electric Luminaries
 2. UL 496 - Edison Base Lamp holders
 3. UL 542 - Lamp holders, Starters and Starter Holders for Fluorescent

- | | |
|--------------|---|
| | Lamps |
| 4. UL 773 - | Plug-In, Locking Type Photo controls for Use with Area Lighting |
| 5. UL 935 - | Fluorescent-Lamp Ballast |
| 6. UL 1029 - | High-Intensity-Discharge Lamp Ballasts |
| 7. UL 1598 - | Standard for Safety of Luminaries |

L. The Energy Independence and Security Act of 2007 (EISA)

1.04 QUALITY ASSURANCE

A. Comply with Project Quality Program Requirements (see 1.02 above).

1.05 SUBMITTALS

A. Refer to Section 01 33 00 - Submittal Procedures, for submittal requirements and procedures.

B. Luminaries Manual: Provide documentation indicating fixture construction, photometric performance, and installation and maintenance procedures, including the following:

1. Manual shall be complete with cover, title page and table of contents. Cover and title page shall identify document, project, client, Contract name, number and date of issuance. Table of contents shall provide overall document scope and structure and, as a minimum, heading for each fixture type with each grouping prefaced by general information report sheet.
2. Manufacturer's product data and drawings of sufficient detail to show following:
 - a. Fixture housing, hardware and finishes.
 - b. Light controlling elements.
 - c. Electrical components including lamp holders, ballast, and provision for conduit entry.
 - d. Support details. Indicate weight of fixture, complete with lamps.
3. Indicate procedures for installation of complete lighting unit in final service location. Provide templates for placement of anchor bolts. Dimension locations of openings and parts interfacing with remote systems, such as, mounting hardware, auxiliary electrical equipment, lighting control equipment and lamps.
4. Maintenance procedures in accordance with Section 01 78 23 - Operation and Maintenance Data, including:
 - a. Materials and components shall be clearly indicated in parts list.
 - b. Re-lamping methods.

- c. Special tools required.
 - d. Frequency of inspection, tightening or other service recommended for preventive maintenance.
5. Complete photometric calculations using industry standard computer software for lighting. Furnish photometric lighting summary showing average, minimum, maximum and lighting ratios including Maximum/Minimum and Average/Minimum.
- B. Sample of each type of custom lighting fixture, complete with lamps and typical of the manufacturer's products. Supply sample for testing at 120 volts ac, complete with six-foot cord and plug.
- 1. Each sample: Identify materials including alloy, thickness, gauge, and temper.
 - 2. Do not begin processing of production materials until written approval of samples has been obtained.
 - 3. Variation in color of materials shall be within color range established by approved samples.
- C. Provide four copies of reports of factory and field tests performed, in accordance with referenced codes and standards and Specification requirements.
- D. Test Procedures.

1.06 DEFINITIONS (Not Used)

1.07 TESTS AND ACCEPTANCE

- A. Lighting Fixtures to be Tested: Typical unit of type represented, clean and free of mechanical defects, equipped with proper fittings, and with lamp of size and type and in position recommended for service operation.
- B. Test UL listed material, equipment and components in accordance with UL standards. Material, equipment and components not covered by UL standards shall be tested in accordance with nationally recognized standards approved by CITY or its designee or indicate items and materials whose production is periodically inspected by a nationally recognized testing laboratory approved by CITY or its designee. Provide material, equipment and components bearing a label or certification of such inspection.
- C. Perform and report tests for photometric performance in accordance with accepted methods outlined by IES for photometric testing, and include data on candlepower distribution, zonal lumens, maximum luminance values and luminaire efficiency including complete coefficients of utilization tables to indicate compliance with performance requirements.
- D. Report test data on 8 1/2 inch by 11-inch sheets, certified by a nationally recognized

independent testing laboratory.

1.08 DELIVERY, HANDLING, AND STORAGE

- A. Refer to Section 01 66 00 - Product Storage and Handling Requirements, for general requirements for product delivery, storage, and handling procedures.
- B. Handle and transport products in a manner to prevent damage.
- C. Wrap and package products to prevent damage. Furnish packaging plan for review and acceptance.
- D. Indelibly mark each carton with minimum 1/2-inch-high letters with following information:
 - 1. Fixture, lamp or component type.
 - 2. Quantity.
 - 3. Manufacturer's name and product number.
- E. Store products in a clean, dry and secure storage area pending installation.

1.09 WORKSITE CONDITIONS

- A. Install lamps before date of final inspection, except for pole-mounted fixtures, or as directed by CITY or its designee.
- B. Install exposed parts of fixtures after construction, painting and general clean-up in area have been accomplished.
- C. Inspect surfaces and structures where products will be installed before beginning Work of this Section; ensure surface and structures are capable of supporting products. Surfaces concealed by products shall be finished before products are installed.

PART 2 - PRODUCTS

2.01 LIGHTING FIXTURES

- A. Provide lighting fixtures, complete and ready for service, in compliance with UL 1570, 1571, and 1572 as applicable. Provide quantity, type, material, finish, electrical components, and characteristics, with necessary hardware and auxiliary equipment, as indicated. Light fixtures used and approved as raceways shall be UL listed for such service.
 - 1. Clearly mark fixtures, in locations not visible after installation, with manufacturer's name and catalog number, voltage, acceptable lamp type, and maximum

wattage.

2. Fixtures shall be UL listed for the intended application.
 - a. Fixtures in outdoor locations exposed directly to weather shall be listed for wet locations.
 - b. Fixtures in soffits and other protected outdoor locations, and fixtures exposed to water and extreme humidity indoor shall be listed for damp locations.

B. Materials

1. Thicknesses, gauges, and tempers of products shall be as recommended by manufacturer for specific finish, proper forming operations and structural requirements.
2. Reflector material shall be prefinished aluminum, minimum thickness 0.032-inch, Architectural Type 1, with Class M1 anodic coating providing 83 percent reflectivity minimum.
3. Acrylic for lenses and diffusers shall be virgin-acrylic extrusion or injection molded.
4. Polycarbonate for lenses and diffusers shall use resin designed for use with High Intensity Discharge (HID) and fluorescent lamps.
5. Glass for lenses and diffusers shall be tempered borosilicate rolled glass, minimum 1/8 inch thick.
6. Stainless steel shall meet ASTM A167, Type 316.

C. Finishes

1. Provide lighting fixtures completely factory-finished in colors to match accepted samples and in accordance with manufacturer's recommendations for specific application.
2. Do not begin finishing operations until fabrication and forming operations have been completed.
3. Aluminum to be anodized shall be given a preanodic treatment followed by Architectural Class 1 anodic coating (AA-M12C22A42).
 - a. Anodize aluminum in accordance with procedures established by alloy manufacturer to achieve color within specified range.
 - b. Apply clear aliphatic urethane protective coating to exposed aluminum surfaces that may experience prolonged contact with caustic material, e.g., concrete, plaster.
4. Clean metals for painting with a five-stage phosphatizing system.
5. Interior fixtures with surfaces not exceeding 150°F shall be painted with two coats minimum of alkyd paint or acrylic gloss enamel to dry film thickness (DFT) of 2.5 mils minimum.

6. Interior fixtures with surfaces exceeding a temperature of 150°F, but not exceeding 300°F shall be painted with silicone-alkyd enamel, minimum two coats to a total DFT of 2.5 mils, minimum.
7. Paint interior reflective surfaces with same coating as interior fixtures.
8. Finish fixtures specified to be porcelain enameled, and painted fixtures with reflectors specified to be porcelain enameled in accordance with requirements of PEI S-100 or PEI LS-105.
9. Provide gloss white reflective surfaces not specified to be specular; guaranteed non-yellowing, with reflectance rating not less than 88 percent.
10. Galvanized coating shall be hot-dip galvanized in accordance with ASTM A123. Where painting galvanized surface is indicated, pre-treat surface with a spray of zinc chromate-vinyl butyryl wash primer at least 0.05 mil thick; apply 80 percent zinc-dust, 20 percent zinc-oxide, alkyd resin primer conforming to FS TT-P-641, then apply single-component, Type II, modified acrylic top coat.

D. Electrical Components:

1. Lamp holders:
 - a. Provide lamp holders and sockets of class and style recommended by lamp manufacturer for specific lamp required for each fixture design.
 - b. Rigidly and securely fasten lamp holders and sockets to mounting surface with necessary provisions to prevent lamp holder from turning. Lamps shall be front removable without dismantling any part of fixture.
 - c. Locate lamp holders and sockets correctly in lighting fixtures to place each lamp in proper position with relation to fixture design. Clearly mark lamp holders and sockets to indicate manufacturer, lamp type, voltage and appropriate listings.
 - d. Provide incandescent and high intensity discharge lamp holders of glazed porcelain body with nonferrous metal components of heavy duty design, vibration resistant. Edison-based lamp holders shall be in accordance with UL 496.
 - 1) Provide metal halide lamps with mogul screw base sockets.
 - 2) Use position-oriented mogul base sockets for metal halide lamps to be operated in horizontal position.
 - 3) Use high voltage mogul lamp holder, 5 kV pulse rated, 1500 watts, 600 volts, for high pressure sodium lamps up to and including 1000 watts.
 - e. Provide fluorescent lamp holders of white urea, spring loaded with silver-plated contacts of pedestal or button type, in accordance with UL 542.
 - 1) For rapid start 430 MA lamps use medium bi-pin spring-loaded lamp holders of the tombstone or butt configuration.
 - 2) For miniature fluorescent preheat and circline lamps use special lamp

holders as recommended by individual lamp manufacturer.

2. Ballasts:

- a. Supply high-efficiency, energy-saving electronic type ballast as noted in Title 24 CEC, and with operating characteristics in accordance with recommendations of lamp manufacturer. Provide ballasts suitable for line voltage with minimum 0.9 power factor, and maximum current crest factor of 1.8. Provide reliable lamp ballast starting at minimum temperature indicated below. Provide insulation used in starters and capacitors suitable for operation in temperature attained. Mount each ballast securely inside fixture to obtain necessary heat dissipation. High Intensity Discharge (HID) ballasts shall comply with UL 1029. Fluorescent ballasts shall pass performance test and comply with UL 935.
- b. High Intensity Discharge:
 - 1) Metal halide lamps, 175-watt size and smaller shall be operated by constant wattage autotransformer, CWA type ballast. Provide reliable single lamp starting ballasts: maximum +/- five percent lamp watts variation for a +/- 10 percent input voltage variation.
 - 2) Metal halide lamps, larger than 175-watt size shall be operated by constant wattage type ballast. Provide reliable single lamp starting ballasts: maximum +/-10 percent lamp watts variation for a +/- 10 percent input voltage variation.
 - 3) High-pressure sodium lamps, 250-watt size and larger shall be operated by constant wattage autotransformer, CWA type ballast. Provide reliable lamp ballasts starting at minus 20°F, and maximum +/- five percent lamp watts variation for a +/- 10 percent input voltage variation.
- c. Fluorescent, Electronic ballasts shall meet requirements of UL and CBM and be certified by ETL and bear appropriate UL label. Electronic ballasts shall be high power factor, certified for voltage and number of lamps specified; equip with internal protectors unless otherwise specified.
 - 1) Provide two lamp ballast where practicable, including continuous rows of one-lamp fixtures; use one lamp ballast only where fixture layout does not permit use of two-lamp ballasts.
 - 2) Fluorescent ballasts for interior use shall be electronic rapid start type.
- d. Ballasts shall withstand input power line transients as defined in ANSI C62.41. Power factor shall be 90 percent or higher. Lamp crest factor shall be below 1.7 for rapid start ballast and below 1.85 for instant start ballasts. Average ballast factor (BF) shall be minimum 85 percent under ANSI C82.2 conditions using energy saving lamps.
- e. Total harmonic distortion of input current to electronic ballasts shall not exceed 20 percent of input current; comply with FCC concerning generation of electromagnetic interference (EMF) and radio frequency interference (RFI).

- f. Electronic ballasts shall be class A sound rated, UL class P thermally protected. Provide ballasts with internal fuse to protect electrical power supply from internal component failure. Protect from short circuit if improperly wired.
 - 1) Correctly label systems using tandem wired luminaire with master/slave ballast arrangement. Label shall be in lamp compartment of each luminaire; identify function of luminaire.
- g. Splices internal to fixtures shall be made within separate splice compartments. Use nylon insulated crimped connections or insulated quick disconnects.
 - 1) For splices to branch circuit wiring in separate junction boxes use flame retardant thermoplastic cap with fully seated helical metal spring and threaded entry.
 - 2) Internal wiring shall not be visible at viewing angles above 45 degrees from vertical. Use additional wire clamps as required. Anticipate increased visibility if fixtures are mounted on or recessed within a sloping surface.
 - 3) Fixtures fed from more than one panel, such as for normal and night or emergency operation shall have separate neutrals from each panel.
 - 4) Furnish code-approved wiring in ceiling cavities forming air plenums.
 - 5) T-8 Rapid-start, energy-saving type, fluorescent lamps shall be operated by rapid-start, energy saver, 60 Hz ballast. Provide ballasts to give reliable lamp starting at 50°F, with a sound level rating of A. Lamp voltage variation shall not exceed + five percent and - 10 percent.
 - 6) Miniature energy saving type fluorescent preheat and circline lamps shall be operated by preheat/low power factor/120-volt, 60 Hz ballast. Ballast shall provide reliable lamp starting at 50°F, with a sound level rating of A.
 - 7) Equip ballasts installed inside communication rooms and at platform area with radio interference filters and third harmonic suppressors.

3. Fixture Wiring:

- a. Provide fixture wires of stranded tinned-copper construction, not smaller than No. 16. Provide insulation of silicone rubber type SF-2, 200°C rated. Mark conductor size, temperature rating, voltage and manufacturer clearly on insulation of each conductor.
- b. Provide wires between lamp holders and associated operating and starting equipment with same ampacity rating as leads from the ballast. Wiring within fixtures shall comply with NFPA 70.
- c. Tape wires at points of abrasion. Do not permit splices within fixtures except as required to connect lamp holders and ballast. Provide wireways and wiring channels with rounded edges or bushed holes where conductors pass through. Install insulated bushings at points of wiring entrance and exit.

- d. Fixture Grounding shall be via factory-installed grounding device. Use grounding device for connecting separate grounding conductor to fixture housing.

E. Fixture Hardware:

1. Latch and release mechanism, hinges, pins and other retaining parts of fixtures; screws, bolts or other assembly and mounting parts shall be Type 316 stainless steel. Springs shall be heavy-duty stainless steel. Use self-retaining type hardware.
2. Hold light transmitting panels in frames in neat, rattle-free manner to provide proper tolerance for normal expansion and contraction.
3. Fabricate internal brackets from ASTM A1008 sheet steel, zinc coated after fabrication or finished extruded aluminum.
4. Form gaskets, sealants and adhesives from silicone rubber.
5. Provide Type 316 stainless steel bolts, nuts, washers, screws, nails, rivets and other fastenings necessary for proper installation or assembly of Work. Provide nuts with captive externally-footed lock washers.

F. Fixtures - From the following manufacturer's or approved equivalent.

1. Cole
2. Paramount
3. Prudential
4. Daybrite
5. McPhilben

2.02 FIXTURE MOUNTING HARDWARE

- A. Provide fixtures with brackets, straps, canopies and stems, and miscellaneous hardware suitable for mounting method selected.
- B. Secure mounting brackets to housing; quantity and spacing as required for proper installation. When exposed to public view, fabricate and finish hardware in material matching fixture body.
- C. Canopies, Holders and Similar Parts shall be drawn or spun in one piece with minimum 0.026-inch finished thickness.
- D. Tubing Used for Stems shall be seamless drawn with minimum 1/16-inch wall thickness of size and length required for the installation. Provide stems for pendant mounted fixtures of length required for specified mounting height with swivel hangers or ball aligners as required.

2.03 LAMPS

- A. Provide each lighting fixture with the number, type and wattage of lamps required. Lamps used in illumination system shall be standard manufacture, readily available, and of highest efficiency and life consistent with other requirements of illumination system; conforming to Lamp Efficiency Standards.
- B. Hot Cathode Fluorescent Lamps shall maintain CRI = 85 minimum except as indicated. Refer to Lighting Fixture Standards for details. Lamps shall provide minimum 10,000 hours average life, lumen maintenance factor 90 percent or better and with minimum 2600 maintained lumens.
- C. Metal Halide Lamps shall be clear or coated as required. 175-watt lamps shall be suitable for outdoor use and operate in any position. Lamps unless otherwise specified, shall provide 10,000 hours average life, minimum 10,500 maintained lumens with CRI = 65 or better.
- D. High Pressure Sodium Lamps shall be clear or coated as required, CRI = 65 minimum, suitable for outdoor use and operating in any position and with minimum 24,000 hours average life.
- E. Equivalent LED lamps shall match as closely as possible the color characteristics of the lamp they are intended to replace.

2.04 NOT USED

PART 3 - EXECUTION

3.01 LIGHTING FIXTURES

- A. Install lighting fixtures in accordance with manufacturer's instructions, complete with lamps, hangers, brackets, poles, fittings and accessories, ready for operation as required.
- B. Determine and verify exact locations and spacing from reflected ceiling plans and other reference data prior to installation.
- C. Align, mount and level lighting fixtures uniformly.
- D. Avoid interference with, and provide clearance for, equipment. Where indicated locations for lighting fixtures conflict with locations of other equipment, change locations of lighting fixtures by minimum distances necessary and as approved by CITY or its designee.
- E. Protect fixtures from damage as necessary throughout construction; mask fixtures and associated trim as required.

- F. For suspended lighting fixtures, provide mounting height clearances between bottom of fixtures and finished floor.
- G. Anchor lighting fixture supports to structural slab or to structural members. Supports shall maintain fixture positions after cleaning and re-lamping Mechanical and Electrical components and their supports shall satisfy the Seismic Design Requirements of California Code of Regulation (CCR) Title 24, Part 2, Chapter 16 and Chapter 13 of ASCE 7.
- H. Surface-mounted lighting fixtures shall be rigidly supported from mounting surfaces. Provide 1/4-inch clearance between surfaces when fixture is flat-mounted against concrete surfaces. Install fixtures with a noncumulative dimensional alignment tolerance of 1/16 inch when mounted in continuous runs with one inch spacing between individual fixtures. Provide watertight nipples carrying wires between fixtures.
- I. Where aluminum is placed in contact with dissimilar materials, except galvanized steel, zinc or stainless steel, treat contact surfaces as follows:
 - 1. When in contact with dissimilar metals apply prime coat of zinc chromate primer followed by two coats aluminum paint or masonry paint.
 - 2. When in contact with concrete, masonry and plaster apply zinc chromate primer to aluminum contact surfaces, followed by two coats bituminous paint or pressure tape.
 - 3. When in contact with wood or other absorptive materials apply two coats of aluminum house paint to substrate and protect aluminum contact surfaces with bituminous paint.
- J. Welding:
 - 1. Locate welds in assemblies to be anodized to conceal visible discoloration in heat-affected zone.
 - 2. Where weld metal will be exposed after anodizing, select filler alloys to closely match composition of base metal. Follow manufacturer's recommendations for filler alloys.
- K. Provide pendant fixtures with stem swivel hangers to ensure plumb installation with minimum 45-degree swing from horizontal in all directions.
 - 1. Where 45-degree movement of fixture is not possible due to field conditions, provide, in addition to above, cross bracing to restrict movement in direction of potential contact. Provide tubing not less than 3/16-inch diameter.
 - 2. Motion of swivels or hinged joints shall not cause sharp bends in conductors or damage to insulation.
 - 3. For heavy pendant-mounted fixtures, where support is to be independent of outlet box, provide stem swivel hangers with fixture studs.

- L. Install fixtures to be pole-mounted in accordance with manufacturers recommended installation practices.
- M. Provide required lamps in each pole-mounted lighting fixture as soon as fixtures are properly installed.

3.02 BALLASTS

- A. Install ballasts, other than those mounted integrally within luminaries, in manner that ballast is protected from weather, moisture and other atmospheric conditions and in ambient temperatures that will not cause temperature of ballast housing hot-spot to exceed UL requirements. Voltage drop to lamp, due to remote ballast mounting, shall not exceed one percent of nominal lamp voltage. Provide secondary ballast conductors with 1000-volt insulation. When more than one ballast is mounted at one location, provide six inches minimum spacing between ballasts in a horizontal direction and 12 inches in a vertical direction. Mount ballast components securely inside fixture in manner to obtain necessary heat dissipation. Replace noisy ballasts as directed by CITY or its designee.

3.03 CONCRETE BASES

- A. Obtain necessary templates and anchor kits before starting work.

3.04 GROUNDING

- A. Ground exterior lighting systems with continuous bonding circuit; ground to light standard and at each feed point using No. 6 stranded copper wire with green THWN insulation between lighting fixture and pole base when pole mounted fixture is installed.

3.05 FIELD QUALITY CONTROL AND INSPECTION

- A. Perform field test in accordance with test procedure recommended by manufacturer and as specified Section 26 09 23 - Lighting Controls and Instrumentation, Section 26 08 00 - Test Support/Start-Up and as directed by CITY or its designee.
- B. Inspect luminaries, lamps and associated hardware before and after installation; ensure quality and type are as specified and indicated and are free of defects and damage.
- C. Deliver luminaires and lighting equipment to work site complete with related items, completely wired and assembled.
- D. Whenever practicable, test lighting systems at same time that distribution panelboard or switchgear is tested.

- E. Adjustable Fixtures - Make final adjustments in presence of CITY or its designee immediately prior to final approval.
- F. Replace lamps and ballasts that fail within 90 days after final acceptance.
- G. Test light poles for continuity to grounding system.
- H. Clean reflecting surfaces, lenses, bottles, louvers, reflector cones, exterior surfaces and trim, as recommended by manufacturer, prior to final acceptance.

END OF SECTION 26 50 00

SECTION 33 40 00

STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Catch basins, furnishing and installing new storm drains, manholes, catch basins, junction structures, and appurtenances and all labor, materials and equipment, as in accordance with Standard Specifications for Public Works Construction (SSPWC), and work shall also conform to the latest version of Amendments to the 2012 Edition and 2014 Cumulative Supplement to the Greenbook Specifications" as may be monitored by local jurisdictions.

1.02 RELATED SECTIONS

- A. Section 01 33 00: Submittal Procedures
- B. Section 03 05 15: Portland Cement Concrete
- C. Section 03 20 00: Concrete Reinforcement
- D. Section 03 41 00: Precast Concrete
- E. Section 31 20 00: Earthwork
- F. Section 33 01 00 Maintenance and Support Utilities

1.03 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM D1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
 - 2. ASTM D2241 Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series)
 - 3. ASTM D2467 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
- B. Standard Specifications for Public Works Construction (SSPWC), Latest Edition

1.04 QUALITY ASSURANCE

- A. Before beginning construction of a manhole reach, confirm that the entire section of storm drain can be constructed as indicated.
- B. Immediately notify Owner of storm drains or other conflicting system discovered, but not indicated on the Contract Drawings or marked in the field.
- C. Codes and Regulations: Conform to the applicable latest approved edition Los Angeles County Standard Plans and the Standard Specifications for Public Works Construction (SSPWC), latest edition.

1.05 SUBMITTALS

- A. Refer to Section 01 33 00, Submittal Procedures, for submittal requirements.
- B. Shop Drawings:
 - 1. Showing details of pipe joints for each size pipe including type of gasket material.
 - 2. For special and modified manholes, catch basins, junction structures and box culverts.
- C. Testing Data and Reports

1.06 DEFINITIONS (Not Used)

1.2 DELIVERY, STORAGE AND HANDLING

- A. Deliver material and products with certified tickets to the job-site were directed by the Engineer.
- B. Store materials on the job located where directed by the Construction Manager and not interfering with work operations of this Section.
- C. Handle materials safely in a manner avoiding damage prior to and during installation and not damaging work of other trades.
- D. Where materials may be affected by the environment, cover materials

according to manufacturer's specifications.

1.3 WORKSITE CONDITIONS

- A. Indicated locations of existing facilities and systems are approximate. Investigate and determine exact location and nature of utilities, facilities, and system; be solely responsible for damage caused by construction activities.
- B. Excavations for drainage - Dry immediately before and after products are installed. Surfaces and structures to and on which drainage products will be installed shall be capable of supporting products. Before products are installed, finish surfaces which will be concealed by after installation of products.
- C. Appropriate agency having jurisdiction will inspect its facilities before backfilling.
- D. Before beginning construction of a manhole reach confirm that the entire Section of storm drain can be constructed.
- E. Immediately notify Owner or its designee and the agency having jurisdiction of storm drains discovered, but not previously identified or marked in the field.

1.4 INSPECTION

A. Required:

- 1. For all work within Owner property lines concerning connections to the City of Canyon Lake and County of Riverside Flood Control (CRFCD) storm drains, as called for on the Contract Drawings, contractor shall make necessary arrangement with the City for inspection, including obtaining all required permits.
- 2. Test pipes shall be selected from the lot and tested in accordance with the requirements specified in SSPWC, but not necessarily limited to. At the place of manufacturer, the Engineer or Inspector will indicate tentative acceptance of the pipe for delivery by marking with a stamp. Final acceptance will be made only when the project has been completed.
- 3. All pipe penetration and required fire stopping shall be inspected prior to any wall closure.

- B. Notification: Contractor shall notify all local governing agencies, arrange, and pay for required inspection.

1.5 COORDINATION

- A. Required: All on-site storm drain shall be fully coordinated with other Contracted Work operations as per approved work scheduled.

PART 2 - PRODUCTS

2.1 FRAMES, COVERS, GRATES, PIPE FITTINGS AND MISCELLANEOUS ITEMS

- A. In accordance with SSPWC and as approved by the City, Department of Public Works, and the County of Riverside Flood Control.
- B. Guideway cross drain grates shall be J.R. HOE, type KY-460 or equivalent. Castings shall be uniform and free from defects. Castings shall be manufactured with smooth finish and well cleaned by shotblast. Gray iron castings shall conform to ASTM A48, Class 35B and ductile iron conforming to ASTM A536. Cast dimensions may vary per industry standards, typically (+/—) 1 /16" per unit foot.

2.2 CONCRETE REINFORCEMENT

- A. As specified in Section 03 20 00, Concrete Reinforcement.

2.3 CONCRETE MATERIALS

- A. In accordance with SSPWC, Section 03 05 15, Portland Cement Concrete.

2.4 PRECAST UNITS

- A. As specified in Section 03 40 00, Precast Concrete.

2.5 GRAVITY PIPE

- A. Reinforced Concrete Pipe (RCP) - As specified in SSPWC, Section 207-2, with rubber gasket type joints and as modified by requirements of local jurisdiction and on City's pre- approved products list.
- B. Nonreinforced Concrete Pipe (CP) - As specified in SSPWC, Section 207-1, with rubber gasket type joints and as modified by requirements of local jurisdiction.

2.6 EXISTING MANHOLE FRAMES AND COVERS

- A. Remove and salvage manhole frames and covers; reuse salvaged materials

as approved by Owner or its designee or appropriate local jurisdiction having authority.

2.7 MORTAR

- A. As specified in Section 04 05 13, Mortar and Grout.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until detrimental conditions are corrected as directed by the Engineer.

3.2 EXCAVATION AND TRENCHING

- A. Piping, manhole, catch basin and special and junction structure excavation - conform to SSPWC and requirements of local jurisdiction. Notify Underground Service Alert (USA) of Southern California at least three days before the start of excavation so that USA member organizations existing utilities can be marked. USA located facilities for members only. Notify nonmember utilities to mark facilities separately. Contractor is also required to provide a minimum of 7 working day notice to Owner to initiate identification and marking of existing Owner-owned utilities within the yard.

3.3 INSTALLATION

- A. Install storm drainage system in accordance with SSPWC, Section 306 and standard of local jurisdiction.
- B. Install PVC and HDPE piping and storm drain manhole under temporary decking as shown on the "Utility Standard Design Guide". Temporary Support for Utilities Standards drawings.
- C. Install PVC pipe from surge chamber to storm drain system as indicated.

3.4 MANHOLES, CATCH BASINS, JUNCTION BOXES, AND BOX CULVERTS

- A. Construct as indicated.

3.5 ENCASEMENT IN CONCRETE

- A. Support and brace pipe indicated to be entirely or partially embedded in concrete; prevent movement and displacement of pipe during testing and during placement and consolidation of concrete. Provide concrete in accordance with SSPWC Subsection 201-1.1.2 and requirements of local jurisdiction, unless otherwise indicated. Place concrete for pipe encasement all around the pipe as indicated on plans. Provide trench width not less than six inches wider than outside diameter of pipe.

3.6 STORM DRAIN SYSTEM CONSTRUCTION

- B. General: In strict accordance with pipe manufacturer's recommendations and the SSPWC.
- C. Installation of Pipe: In accordance with Sec. 306-1.2 INSTALLATION OF PIPE of the SSPWC on unyielding bedding foundations with uniform bearing under full length of pipe barrels; walking on or disturbing pipe in any manner after joints have been made, not permitted; at close of each day's work or whenever work is stopped for any reason, protect ends of pipe with temporary tight fitting closures. Slope as per Contract Drawings.
- D. Seal all wall and flooring penetrations and sleeves with applicable fire stopping or sealant material. Obtain inspection prior to wall closure or trench backfill.
- E. Bedding:
 - 1. Provide for a minimum 6-inch thickness of bedding sand below bottom of pipe barrels; any over-excavations may require concrete pipe bedding and to be filled with slurry backfill or structural backfill in accordance with Standard Plan S-251, latest edition, at Contractor's expense; bedding for Case 1: sand to be tamped and compacted and accurately graded and shaped to support bottom quadrant of pipe, with coupling holes dug prior to placement of pipe. Case 2: Class 1 or 2 Aggregate.
 - 2. Backfill: Provide sand backfill to an elevation of 12 inches over the top of the pipe and floor in accordance with Section 306-1.3.3 – Water Densified Backfill. Use clean earth material for remainder of backfill to required finish grade and compact for yard paving.
- F. Pipe Juncture with Concrete Structures: Set pipe ends as necessary for casting-in-place or grouting-in-place after construction of such structures. Junctures with existing storm drain channels to be in accordance with the standards and specifications of the Los Angeles County Flood Control District.
- G. Fill Joints: (Other than wedge-lock type) with mortar troweled smooth on inside

of pipe; keep mortar joints damp until backfill is placed.

- H. Pipe Juncture with Concrete Structures: Set pipe ends as necessary for casting-in-place or grouting-in-place after construction of such structures.
- I. Pipe Joints of Corrugated Pipe: Field jointing shall conform to provisions of Section 306-1.2.7 - FIELD JOINTING OF CORRUGATED METAL PIPE of the SSPWC. Provide prefabricated turns and bends on change in direction, joints to meet job needs.
- J. Corrugated Pipe Anchors:
 - 1. Where pipe is below grade provide cast-in-place concrete collars where indicated on the Contract Drawings

3.7 CONCRETE STRUCTURES

- A. General: Catch basins, gutters, manhole interceptors, etc. as indicated on the Contract Drawings.
- B. Construction: As indicated on the Drawings and specified in Section 03 30 00 - CAST-IN- PLACE CONCRETE.
- C. Catch Basins: Section 303-1- CONCRETE STRUCTURE and 303-1.4.4(b) - STANDARD CATCH BASIN of the SSPWC as applicable. Forms to be of 1-inch minimum thick plywood; remove forms minimum 24-hours after concrete pour; top surface of catch basins to conform to drawing details or paving grades and as directed by the Engineer; steel trowel finish and lightly brushed with bristle brush all exposed surfaces; gratings and frames to be set flush and level with top surface of basin or as otherwise indicated on the Contract Drawings.
- D. Maintenance Holes: Construct at location and to elevations indicated on the Contract Drawings, in accordance with details and materials noted thereon; set precast concrete segments with full mortar joints troweled smooth on interior of manhole; set cover frames in full mortar bed and accurately to meet paving grades.

3.8 STREET WORK

- A. Required: All work outside the property lines extending under the sidewalks and discharging into gutter through the curb shall comply with applicable Sections of the SSPWC and as directed by the Engineer. Complete all such work and obtain

inspection prior to start of any concrete paving, curb and gutter, and sidewalk.

- B. Repair all street paving and bases in accordance with the scopes indicated on the contract drawings, and in Section 31 20 00: Earthwork.

3.9 EXFILTRATION TESTING

- A. Required: Provide personnel and equipment necessary, and perform tests required to demonstrate that the work of this Section has been completed in accordance with the specified requirements.
- B. Perform a water exfiltration test on new piped storm drain systems located above or within 50 feet of underground, Owner owned structures. Perform test in accordance with SSPWC Subsection 306.1.4.2 Water Exfiltration Test as modified by requirements of local jurisdiction, witnessed by Owner or its designee. Repair leaks and retest at no additional cost to Owner or local jurisdiction having ownership.
- C. Hydrostatic Test on Watertight Joints:
 - 1. Make a hydrostatic test on each watertight joint. Test one sample of each type watertight joint used. If one sample fails because of faulty workmanship, test an additional joint.
 - 2. Demonstrate that joints in reinforced and unreinforced concrete pipe comply with ASTM C443 - SPECIFICATION FOR JOINTS FOR CIRCULAR CONCRETE SEWER AND CULVERT PIPE, USING RUBBER GASKETS.
 - 3. Make tests in concrete pipe and clay pipe at an internal hydrostatic pressure of 10 psi for 24-hours.
 - 4. Replace or repair joints found to be faulty. Repeat the test and repair cycle until joints are demonstrated to meet the specified requirements.

3.10 STORM DRAIN LEAKAGE TESTING

- A. Test installed drain lines by filling lines with water and applying four psi hydrostatic pressure to lines in presence of the Owner or its designee. Inspect pressurized lines for leaky joints. Repair leaky joints and Lines, repressurize and reinspect joints and lines after necessary repairs.

3.11 BACKFILLING

- A. In accordance with SSPWC, Subsection 306-1.3 and requirements of local jurisdiction for trenches.
- B. Pipe bedding within station fill in accordance with Section 31 20 00, Earthwork, and requirements of local jurisdiction.
- C. Install pressure piping in accordance with SSPWC Section 306 as modified by requirements of local jurisdiction.

3.12 ENCASEMENT IN CONCRETE

- A. Support and brace pipe indicated to be entirely or partially embedded in concrete; prevent movement and displacement of pipe during testing and during placement and consolidation of concrete. Provide concrete in accordance with SSPWC Subsection 201-1.1.2 and requirements of local jurisdiction, unless otherwise indicated. Place concrete for pipe encasement around sides of pipe and against undisturbed walls of trench to height indicated. Provide trench width not less than six inches wider than outside diameter of pipe.

3.13 CASINGS AND SEALS

- A. Nonmetallic Casings - Install casing sleeves and casing end seals in accordance with the installation requirements for casing and sleeves.
- B. Metallic Casings - Install casing insulators and casing end seals in accordance with the installation requirements for casing insulators and casing end seals.

PART 4 - STORM WATER TREATMENT DEVICE

4.1 GENERAL

- A. This item shall govern the furnishing and installation of the infiltration chambers (BMP), including piping, observation port, cleanout, rocks, no-woven filter fabric complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents.
- B. The Contractor shall furnish all labor, equipment, and materials necessary to install the storm water treatment device(s) (SWTD) and appurtenances specified in the Drawings and these specifications.

- C. The manufacturer of the chambers shall be one that is regularly engaged in the engineering design and production of systems deployed for the treatment of storm water runoff for at least five (5) years and which have a history of successful production, acceptable to the Engineer. In accordance with the Drawings, the SWTD(s) shall be a MC-3500 StormTech Chambers manufactured by:

ADS, Advance
Drainage System

- D. Related Sections
1. ADS MC-3500 included in the appendix.
 2. Section 02240: Dewatering
 3. Section 02260: Excavation Support and Protection
 4. Section 02315: Excavation and Fill
 5. Section 02340: Soil Stabilization
- E. Preparation and installation per manufactures recommendation and specifications.
- F. Substitution is not acceptable.

4.2 EXECUTION

- A. The contractor shall exercise care in the storage and handling of the SWTD components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be borne by the contractor.
- B. The SWTD shall be installed in accordance with the manufacturer's recommendations and related sections of the contract documents. The manufacturer shall provide the contractor installation instructions and offer on-site guidance during the important stages of the installation as identified by the manufacturer at no additional expense. A minimum of 72 hours' notice shall be provided to the manufacturer prior to their performance of the services included under this subsection.
- C. To ensure proper installation Contractor shall notify Civil Engineer of Record during the following installation stages to document installation; 1) bottom of exaction, 2) installation base rocks and non-woven filter fabric, 3) after installation of the chambers prior to covering of rocks, 4) completion and prior to back filling.

END OF SECTION 33 40 00

SECTION 33 46

00

SUBDRAINAGE

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. Perforated-wall pipe and fittings.
 - 2. Drainage conduits.
 - 3. Geotextile filter fabrics.
 - 4. Sacked Pervious Drain Rock

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Drainage conduits, including rated capacities.
 - 2. Geotextile filter fabrics.

PART 2 - PRODUCTS

2.1 PERFORATED-WALL PIPES AND FITTINGS

- A. Perforated PE Pipe and Fittings:
 - 1. NPS 6 and Smaller: ASTM F 405 or AASHTO M 252, Type CP; corrugated, for coupled joints.
 - 2. NPS 8 and Larger: ASTM F 667; AASHTO M 252, Type CP; or AASHTO M 294, Type CP; corrugated; for coupled joints.

- 3. Couplings: Manufacturer's standard, band type.
- B. Perforated PVC Pipe and Fittings: ASTM D 2729, bell-and-spigot ends, for loose joints, schedule 80.

2.2 MATERIALS

- A. Soil materials are specified in Section 31 20 00 "Earthwork."
- B. Sacked Pervious Drain Rock: Permeable material for use in backfilling trenches under, around, and over underdrains must consist of hard, durable, clean sand, gravel, or crushed stone and must be free from organic material, clay balls, or other deleterious substances. Permeable material must have a durability index of not less than 40. Use Class 1 permeable material for underdrains unless the class or type of permeable material is specified in the special provisions.
 - 1. Class 1 Permeable Material: Use Class 1, Type A, permeable material in backfilling underdrain trenches. The percentage composition by weight of Class 1, Type A permeable material in place must comply with the gradation requirements shown in the following table:

Class 1 Permeable Material Gradation Requirements

Sieve Size	Type A
2"	--
1-1/2"	--
3/4"	100
1/2"	95-100
3/8"	70-100
No. 4	0-55
No. 8	0-10
No. 200	0-3

2.3 WATERPROOFING FELTS

- A. Material: Comply with ASTM D 226, Type I, asphalt.

2.4 GEOTEXTILE FILTER FABRICS

- A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D4491.

- B. Structure Type: Nonwoven, needle-punched continuous filament.
 - 1. Survivability: AASHTO M 288 Class 2
 - 2. Styles: Flat and sock.
 - 3.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.3 UNDERDRAIN INSTALLATION

- A. Excavate trench bottom to an elevation 6 inches below bottom of pipe.
- B. Fill trench bottom to the bottom of pipe grade with underdrain backfill material to ensure complete and continuous support for the barrel of the pipe.
- C. Excavate bell holes to size necessary to accommodate joint.
- D. Lay pipes in the upstream direction to the lines and grades shown, with the bell point upgrade, and with perforations down.
- E. Keep interior surfaces of pipes clean during placement. Block pipe ends with pipe caps or plugs to prevent filter material from entering the pipes.
- F. Complete installation of geotextile filter fabric as shown on the Contract Drawings.
- G. Prevent flooding the pipe trench before backfilling operations.
- H. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.

3.4 PIPING INSTALLATION

- A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
- B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.
- C. Install thermoplastic piping according to ASTM D 2321.

3.5 PIPE JOINT CONSTRUCTION

- A. Join perforated PE pipe and fittings with couplings according to ASTM D 3212 with loose banded, coupled, or push-on joints.
- B. Join perforated PVC sewer pipe and fittings according to ASTM D 3212 with loose bell- and-spigot, push-on joints.
- C. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

3.6 CLEANOUT INSTALLATION

- A. Comply with requirements for cleanouts specified in Section 33 41 00 "Storm Utility Drainage Piping."
- B. Cleanouts for Subdrainage:
 - 1. Install cleanouts from piping to grade. Locate cleanouts at beginning of piping run and at changes in direction. Install fittings so cleanouts open in direction of flow in piping.
 - 2. Use schedule 40 4" dia PVC pipe and fittings for piping branch fittings and riser extensions to clean out. Set cleanout frames and covers in a cast-in-place concrete anchor. Set top of cleanout flush with grade.
 - 3. Comply with requirements for concrete specified in Section 03 30 00 "Cast-in- Place Concrete."

3.7 CONNECTIONS

- A. Comply with requirements for piping specified in Section 33 41 00 "Storm Utility

Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Connect low elevations of subdrainage system to storm drainage system.

3.8 IDENTIFICATION

- A. Arrange for installation of green warning tapes directly over piping. Comply with requirements for underground warning tapes specified in specified in Section 31 20 00 "Earthwork."

1. Install PE warning tape or detectable warning tape over ferrous piping.
2. Install detectable green warning tape over nonferrous piping and over edges of underground structures.
- 3.

3.9 FIELD QUALITY CONTROL

- A. Tests and Inspections:

1. After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling.
2. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

- B. Drain piping will be considered defective if it does not pass tests and inspections.

- C. Prepare test and inspection reports.

3.10 CLEANING

- A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 33 46 00

