

**CITY OF PETALUMA  
PETALUMA, CALIFORNIA**

**CONTRACT DOCUMENTS FOR  
PETALUMA COMMUNITY SPORTS FIELDS  
BASEBALL DIAMOND PROJECT  
C14501607**

(Notice Inviting Bids, Instructions to Bidders, Bid Forms, General Conditions,  
Special Provisions, Technical Specifications, Construction Agreement,  
Bond Forms, Project Drawings)

**CITY PROJECT NO. C14501607**

**CITY OF PETALUMA - SONOMA COUNTY - CALIFORNIA**

Questions concerning interpretation of improvement plans, special provisions,  
contract documents and bid items shall be directed to:

***Department of Public Works and Utilities  
202 N. McDowell Boulevard  
Petaluma, CA. 94954  
Phone: (707) 778-4546 Fax: (707) 206-6034***

Attention: Ken Eichstaedt

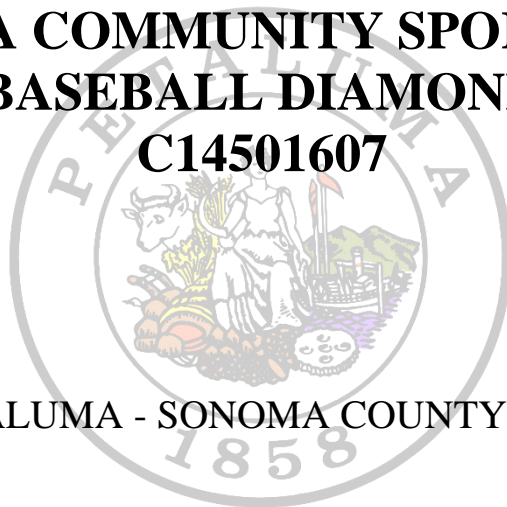
Office Hours: Monday thru Thursday - 8:00 to 5:00 p.m.  
Friday – 8:00 to 4:00 p.m.

**Bid Opening: June 3, 2021 at 2:00 p.m.**

CITY OF PETALUMA  
PETALUMA, CALIFORNIA

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BASEBALL DIAMOND  
C14501607**

CITY OF PETALUMA - SONOMA COUNTY - CALIFORNIA



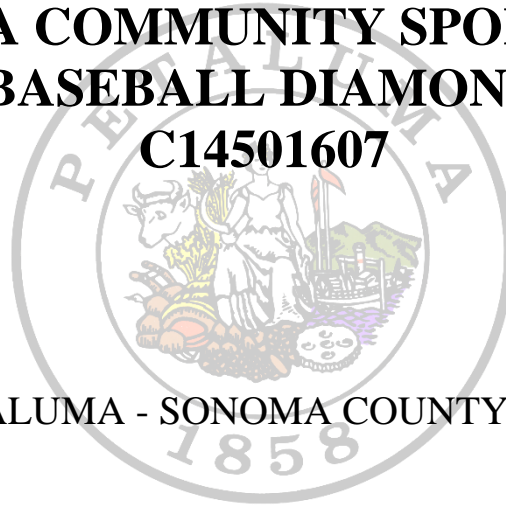
**Landscape Architect**  
GSM landscape architects, inc.  
1700 Soscol Ave., Suite 23  
Napa, CA 94599  
P: 707-255-4630  
Gretchen Stranzl McCann  
Lic: 2790

May 3, 2021

CITY OF PETALUMA  
PETALUMA, CALIFORNIA

**PETALUMA COMMUNITY SPORTS FIELDS  
BASEBALL DIAMOND  
C14501607**

CITY OF PETALUMA - SONOMA COUNTY - CALIFORNIA



**Civil Engineer**  
BKF Engineers  
200 Fourth Street, Suite 300  
Santa Rosa, CA 95401  
P: 707-583-8500  
F: 707-583-8539  
Richard Carlile  
Lic: 57885

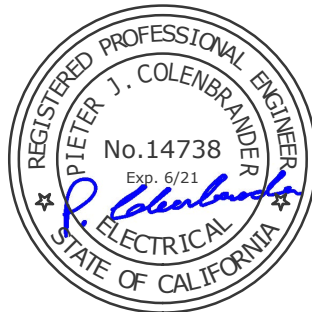


May 3, 2021

CITY OF PETALUMA  
PETALUMA, CALIFORNIA

**PETALUMA COMMUNITY SPORTS FIELDS  
BASEBALL DIAMOND  
C14501607**

CITY OF PETALUMA - SONOMA COUNTY - CALIFORNIA



**Electrical Engineer**  
O'Mahony & Myer  
4340 Redwood Hwy., Suite 245  
San Rafael, CA 94903  
P: 415-492-0420  
F: 415-479-9662  
Pieter Colenbrander  
Lic: 14738

May 3, 2021

CITY OF PETALUMA  
PETALUMA, CALIFORNIA

**PETALUMA COMMUNITY SPORTS FIELDS  
BASEBALL DIAMOND  
C14501607**

CITY OF PETALUMA - SONOMA COUNTY - CALIFORNIA



5/3/2021

**Structural Engineer**  
ZFA Structural Engineers  
1212 Fourth Street, Suite Z  
Santa Rosa, CA 95404  
P: 707-526-0992  
F: 707-526-0217  
Andrew Zafrin  
Lic: S 5921

May 3, 2021

**SECTION I**

**BID FORMS**

**(TO BE SUBMITTED WITH BIDS)**

## NOTICE INVITING BIDS

1. **RECEIPT OF BIDS:** Sealed Bids will be received at the office of the City Clerk of the City of Petaluma located at 11 English Street, Room 4, Petaluma, California, 94952-2610, until 2:00 pm (enter time) on June 3, 2021, for the Petaluma Community Sports Fields Baseball Diamond Project. Any Bids received after the specified time and date will not be considered. Fax and other electronically transmitted Bids will not be accepted.
  
2. **OPENING OF BIDS:** The Bids will be publicly opened and read at 2:00 PM (enter time) on 6/3/21 at the above-mentioned office of the CITY. The CITY reserves the right to postpone the date and time for opening of Bids at any time prior to the aforesaid date and time.
  
3. **COMPLETION OF WORK:** The WORK must be completed within 120 working days after the commencement date stated in the Notice to Proceed.
  
4. **DESCRIPTION OF WORK:** The WORK includes ,in general, soil lime treatment, installation of storm drain system (4" HDPE, 6" HDPE, 12" RCP, 12" HDPE, 18" HDPE and 24" HDPE, catch basin/inlet, cleanout, trench drain, 12" and 24" outfall), sanitary sewer lateral, water service lateral, AC paving, parking lot striping and signage, concrete curb and gutter, pedestrian concrete walkway, electrical lighting conduits, fencing, railing, bio-retention area, synthetic landscape turf system, irrigation system, planting trees, shrubs and sod.
  
5. **SITE OF WORK:** The site of the WORK is located: at the East Washington Street sports fields.
  
6. **OBTAINING CONTRACT DOCUMENTS:** The Contract Documents are entitled "Petaluma Community Sports Fields Baseball Diamond Project."

The Contract Documents may be obtained by 4:00 P.M., Monday through Thursday at the office of Public Work & Utilities, 202 North McDowell Boulevard, Petaluma, California 94954.

If you would like to receive the bid document via the CITY's website, at no cost, please go to:

- <https://cityofpetaluma.org/bid-opportunities-2/>
- Fill out the Plan Holder's form by clicking on the Plan Holder's form link
- Fill in all fields
- Click on the submit button at the end of the form

Submitting the Plan Holder's form on-line automatically puts you on the CITY's Bidders List and you will be notified of any Addendums or information pertaining to the bid by email.

If you would like to purchase bid documents, please call Phone No. 707-778-4585 , Attention: Tiffany Avila, upon payment of \$50 (non-refundable) for each set of Contract Documents (including technical specification and accompanying reduced scale drawings). The scale of the reduced drawings is about one-half of the original scale. At the Bidder's request and expense, the Contract Documents may be sent by overnight mail.

- Full-scale drawings are not available.
- If full-scale drawings are available and desired, they may be purchased at

reproduction cost from \_\_\_\_\_.

7. **BID SECURITY:** Each Bid shall be accompanied by a certified or cashier's check or Bid Bond executed by an admitted surety in the amount of 10% percent of the Total Bid Price payable to the City of Petaluma as a guarantee that the Bidder, if its Bid is accepted, will promptly execute the Agreement. A Bid shall not be considered unless one of the forms of Bidder's security is enclosed with it. Upon acceptance of the Bid, if the Bidder refuses to or fails to promptly execute the Agreement the Bidder's security shall be forfeited to the CITY.
8. **CONTRACTOR'S LICENSE CLASSIFICATION:** In accordance with the provisions of California Public Contract Code Section 3300, the CITY has determined that the CONTRACTOR shall possess a valid Class A license at the time that the Contract is awarded. Failure to possess the specified license shall render the Bid as non-responsive and shall act as a bar to award of the Contract to any bidder not possessing said license at the time of award.
9. **PREFERENCE FOR MATERIAL:** Substitute products will be considered prior to award of the Contract in accordance with Section 3400 of the California Public Contract Code. The Bidder will submit data substantiating its request for a substitution of "an equal" item within 14 days following submission of its Bid. Substantiation date will conform to the requirements of the instructions for Proposed Substitutions of "or equal" items contained in the bid Forms. The ENGINEER will make a determination of approval or rejection of the proposed substitution prior to the award of the Contract. No request for substitution of "an equal" items will be considered by the ENGINEER after award of the Contract.
10. **REJECTION OF PROPOSALS:** The CITY reserves the right to reject all or any part of all bids submitted, waive informalities and irregularities, and will not, to the extent allowed by law, be bound to accept the lowest bid.
11. **BIDS TO REMAIN OPEN:** The Bidder shall guarantee the total bid price for a period of 90 calendar days from the date of bid opening.
12. **CALIFORNIA WAGE RATE REQUIREMENTS:** In accordance with the provisions of California Labor Code Sections 1770, 1773, 1773.1, and 1773.7 as amended, the Director of the Department of Industrial Relations has determined the general prevailing rate of per diem wages in accordance with the standards set forth in Section 1773 for the locality in which the WORK is to be performed. A copy of said wage rates is on file at the office of the City Clerk. It shall be mandatory upon the CONTRACTOR to whom the WORK is awarded and upon any subcontractor under the CONTRACTOR to pay not less than said specified rates to all workers employed by them in the execution of the WORK.
13. **LABOR COMPLIANCE PURSUANT TO CALIFORNIA LABOR CODE §1771.1:** A contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirement of Section 4104 of the Public Contract Code or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.



14. **RETAINAGE FROM PAYMENTS:** The CONTRACTOR may elect to receive 100 percent of payments due under the Contract Documents from time to time, without retention of any portion of the payment by the CITY, by depositing securities of equivalent value with the CITY in accordance with the provisions of Section 22300 of the Public Contract Code. Alternatively, the CONTRACTOR may request, and the CITY shall make payment of retentions earned directly to the escrow agent at the expense of CONTRACTOR. At the expense of the CONTRACTOR, the CONTRACTOR may direct the investments of the payments into securities and the CONTRACTOR shall receive the interest earned on the investments upon the same terms as provided in Section 22300 of the Public Contract Code for securities deposited by the CONTRACTOR. The CONTRACTOR shall be responsible for paying all fees for the expenses incurred by the escrow agent in administering the escrow account and all expenses of the CITY. These expenses and payment terms shall be determined by the CITY's Finance Director or his/her designee and the escrow agent. Upon satisfactory completion of the WORK, the CONTRACTOR shall receive from the escrow agent all securities, interest, and payments received by the escrow agent from the CITY, pursuant to the terms of Section 22300 of the Public Contract Code. Such securities, if deposited by the CONTRACTOR, shall be valued by the CITY, whose decision on valuation of the securities shall be final. Securities eligible for investment under this provision shall be limited to those listed in Section 16430 of the Government Code, bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by the CONTRACTOR and the CITY.

15. **PAYMENT BOND:** Pursuant to and in accordance with California Civil Code Section 3247, a payment (labor and materials) bond must be filed if the expenditure for the WORK is in excess of Twenty-Five Thousand Dollars (\$25,000).

16. **PRE-BID CONFERENCE VISITS:** [At least on box below MUST be checked]

**Check if no pre-bid conference/site is to be held:** \_\_\_\_\_.

**Mandatory pre-bid conference/site visit to be held:** Prospective bidders are required to attend a mandatory pre-bid conference/site visit at 10am (enter time) on 5/25/21, at the Petaluma Baseball Sport Field, offices at \_\_\_\_\_. Prospective bidders that fail to attend the mandatory pre-bid conference/site visit will be ineligible to bid on the project. Following the conference at City offices, City staff and prospective bidders will meet at the project Site. Transportation to the project site will be the responsibility of prospective bidders. The purposes of the conference/site visit are to discuss the scope of the project and bidding requirements and to acquaint bidders with Site conditions.

No information communicated at the pre-bid conference/site visit may amend the project bidding requirements. Project bidding requirements may only be amended by addenda issued by authorized City officials. Following the pre-bid conference/site visit, prospective bidders may submit detailed technical questions in writing. If warranted, the City may respond to such questions by addenda.

**Non-Mandatory pre-bid conference/site visit to be held:** Prospective bidders are invited to attend a non-mandatory pre-bid conference/site visit at \_\_\_\_\_ (enter time) on \_\_\_\_\_, at the \_\_\_\_\_. Following the conference at City offices, City staff and prospective bidders will meet at the project Site. Transportation to the project site will be the responsibility of prospective bidders. The purposes of the conference/site visit

are to discuss the scope of the project and bidding requirements, and to acquaint bidders with Site conditions.

No information communicated at the pre-bid conference/site visit may amend the project bidding requirements. Project bidding requirements may only be amended by addenda issued by authorized City officials. Following the pre-bid conference/site visit, prospective bidders may submit detailed technical questions in writing. If warranted, the City may respond to such questions by addenda.

17. **PROJECT ADMINISTRATION:** All communications relative to the WORK shall be directed to the ENGINEER prior to opening of the Bids.

NAME: Ken Eichstaedt, P.E.  
ADDRESS: Department of Public Works and Utilities  
202 North McDowell Boulevard  
CA 994954  
PHONE: (707) 210-2266

18. **CITY'S RIGHTS RESERVED:** The CITY reserves the right to reject any or all bids, to waive any minor irregularity in a bid, and to make awards to the lowest responsive, responsible bidder as it may best serve the interest of the CITY.

CITY: Petaluma

BY: 

DATE: 5/4/2021

END OF NOTICE INVITING BIDS

## **INSTRUCTIONS TO BIDDERS**

1. **DEFINED TERMS.** Terms used in these Instructions to Bidders and the Notice Inviting Bids which are defined in the General Conditions have the meanings assigned to them in the General Conditions. The term “Bidder” means one who submits a Bid directly to CITY, as distinct from a sub-bidder, who submits a price or quote to a Bidder.
2. **LOCAL BUSINESS LICENSE.** All CONTRACTORS, including subcontractors, not already having a local business license for the work contemplated, will be required to secure the appropriate license before a Contract can be executed.
3. **INTERPRETATIONS AND ADDENDA.**
  - 3.1 All questions about the meaning or intent of the Contract Documents are to be directed to the ENGINEER. Additions, deletions, or revisions to the Contract Documents considered necessary by the ENGINEER in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by the ENGINEER as having received the Contract Documents. Questions received less than 14 days prior to the date of Bids may not be answered. Only answers to such questions issued by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
  - 3.2 Addenda may also be issued to make other additions, deletions, or revisions to the Contract Documents.
  - 3.3 Bidders shall make no special interpretation or inference of intent from differing formats in the Technical Specifications.
4. **BIDDER’S EXAMINATION OF CONTRACT DOCUMENTS AND SITE.**
  - 4.1 It is the responsibility of each Bidder before submitting a Bid:
    - A. To examine thoroughly the Contract Documents and other related data identified in the Bidding Documents (including “technical” data referred to below);
    - B. To visit the site to become familiar with local conditions that may affect cost, progress, or performance of the WORK;
    - C. To consider federal, state, and local Laws and Regulations that may affect cost, progress, or performance of the WORK;
    - D. To study and carefully correlate the Bidder’s observations with the Contract Documents; and

- E. To notify the ENGINEER of all conflicts, errors, ambiguities, or discrepancies in or between the Contract Documents and such other related data.
- 4.2 Reference is made to the Supplementary General Conditions for identification of:
- A. Those reports of explorations and tests of subsurface conditions at the site which have been utilized by the ENGINEER in the preparation of the Contract Documents.
  - B. Those drawings of physical conditions in or relating to existing surface and subsurface conditions (except Underground Utilities) which are at or contiguous to the site which have been utilized by the ENGINEER in the preparation of the Contract Documents.
  - C. Those environmental reports or drawings relating to Asbestos, Hazardous Waste, PCBs, Petroleum, and/or Radioactive Materials identified at the site which have been utilized by the ENGINEER in the preparation of the Contract Documents.
  - D. The ENGINEER makes no representation as to the completeness of the reports or drawings referred to in Paragraphs 4.2A, 4.2B, and 4.2C. above or the accuracy of any data or information contained therein. The Bidder may rely upon the accuracy of the technical data contained in such reports and drawings. However, the Bidder may not rely upon any interpretation of such technical data, including any interpretation or extrapolation thereof, or any non-technical data, interpretations, and opinions contained therein.
- 4.3 Copies of reports and drawings referred to in Paragraph 4.2 will be made available by the CITY to any Bidder on request, if said reports and drawings are not bound herein. Those reports and drawings are not part of the Contract Documents, but the technical data contained therein upon which the Bidder is entitled to rely, are incorporated herein by reference.
- 4.4 Information and data reflected in the Contract Documents with respect to Underground Utilities at or contiguous to the site are based upon information and data furnished to the ENGINEER by the owners of such Underground Utilities or others, and the CITY does not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary General Conditions.
- 4.5 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders on subsurface conditions, Underground Utilities, and other physical conditions, and possible changes in the Contract Documents due to differing conditions appear in Paragraphs 4.2, 4.3, and 4.4 of the General Conditions.
- 4.6 Before submitting a Bid, each Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests, and studies and obtain any additional information and data which pertain to the physical conditions (surface,

subsurface, and Underground Utilities) at or contiguous to the site or otherwise which may affect cost, progress, or performance of the WORK and which the Bidder deems necessary to determine its Bid for performing the WORK in accordance with the time, price, and other terms and conditions of the Contract Documents.

- 4.7 On request a minimum of 2 working days in advance, the ENGINEER will provide each Bidder access to the site to conduct such examinations, investigations, explorations, tests, and studies as each Bidder deems necessary for submission of a Bid. Location of any excavation or boring shall be subject to prior approval of ENGINEER and applicable agencies. Bidder shall fill all holes, restore all pavement to match existing structural section, and shall clean up and restore the site to its former condition upon completion of such explorations. ENGINEER reserves the right to require Bidder to execute an Access Agreement with the CITY prior to accessing the site.
- 4.8 The lands upon which the WORK is to be performed, rights-of-way, and easements for access thereto and other lands designated for use by the CONTRACTOR in performing the WORK are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by the CONTRACTOR. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by the CITY unless otherwise provided in the Contract Documents.
- 4.9 The submission of a Bid will constitute an incontrovertible representation by the Bidder that the Bidder has complied with every requirement of this Paragraph 4 and the following:
  - A. That the Bid is premised upon performing the WORK required by the Contract Documents without exception and such means, methods, techniques, sequences, or procedures of construction (if any) as may be required by the Contract Documents;
  - B. That Bidder has given the ENGINEER written notice of all conflicts, errors, ambiguities, and discrepancies in the Contract Documents and the written resolution thereof by the ENGINEER is acceptable to the Bidder; and
  - C. That the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the WORK.
5. **BID FORMS.** The Bid shall be submitted on the Bid Forms provided by the City. All blanks on the Bid Forms shall be completed in ink. All names must be printed below the signatures. The Bid shall be submitted in a sealed envelope which shall be plainly marked in the upper left hand corner with the name and address of the Bidder and shall bear the words "BID FOR" followed by the title of the Contract Documents for the WORK, the name of the CITY, the address where Bids are to be delivered or mailed to, and the date and hour of opening of Bids.

- 5.2 The Bid must set forth the name and location of the place of business of each subcontractor who will perform work or labor or render service to the prime contractor in or about the construction of the WORK, or a subcontractor licensed by the State of California who, under subcontract to the prime contractor, specially fabricates and installs a portion of the WORK according to detailed Drawings contained in the plans and specifications, in an amount in excess of one-half of 1 percent of the prime contractor's total bid or, in the case of bids or offers for the construction of streets and highways, including bridges, in excess of one-half of 1 percent of the prime contractor's total bid or ten thousand dollars (\$10,000), whichever is greater.
6. CERTIFICATES.
- 6.1 Bids by corporations must be executed in the corporate name by the president, a vice-president, or other corporate officer. Such Bid shall be accompanied by the enclosed Certificate of Authority to sign, attested by the secretary or assistant secretary, and with the corporate seal affixed. The corporate address and state of incorporation must appear below the signature.
- 6.2 Bids by partnerships must be executed in the partnership name and be signed by a managing partner, accompanied by the enclosed Certificate of Authority to sign, and his/her title must appear under the signature and the official address of the partnership must appear below the signature.
- 6.3 Bids by joint venture must be executed in the joint venture name and be signed by a joint venture managing partner, accompanied by the enclosed Certificate of Authority to sign, and his/her title must appear under the signature and the official address of the joint venture must appear below the signature.
7. DISQUALIFICATION OF BIDDERS. More than one Bid from an individual, firm, partnership, corporation, or association under the same or different names will not be considered. If the CITY believes that any Bidder is interested in more than one Bid for the WORK contemplated, all Bids in which such Bidder is interested will be rejected. If the CITY believes that collusion exists among the Bidders, all Bids will be rejected. A party who has quoted prices to a bidder is not hereby disqualified from quoting prices to other Bidders, or from submitting a Bid directly for the WORK. If a Bidder is not registered with the Department of Industrial Relations pursuant to Labor Code Section 1725.5 and Section 1771.1, then the Bid may be rejected as non-responsive.
8. QUANTITIES OF WORK. The quantities of work or material stated in unit price items of the Bid are supplied only to give an indication of the general scope of the WORK; the OWNER does not expressly or by implication agree that the actual amount of work or material will correspond therewith, and reserves the right after award to increase or decrease the quantity of any unit price item of the WORK by an amount up to and including 25 percent of any Bid item in its entirety, or to add additional Bid items up to and including an aggregate total amount not to exceed 25 percent of the Bid price.

9. **SUBSTITUTE OR “OR EQUAL” ITEMS.** Whenever materials or equipment are specified or described in the Contract Documents by using the name of a particular manufacturer and the name is followed by the words “or equal”, the Bidder may write the name of a substitute manufacturer (which the Bidder considers as an “or equal”) in the List of Proposed Substitutions in the Bid Forms. The ENGINEER will make a determination of approval or rejection of the proposed substitution prior to award of the Contract. No request for substitution of an “or equal” item will be considered by the ENGINEER after award of the Contract. The procedure for the submittal of substitute or “or equal” products is contained in the Bid Forms. The Bidder shall not be relieved of any obligations of the Contract Documents or be entitled to an adjustment in the Contract Price in the event any proposed substitution is not approved.
10. **COMPETENCY OF BIDDERS.** In selecting the lowest responsive, responsible Bidder, consideration will be given not only to the financial standing but also to the general competency of the Bidder for the performance of the WORK covered by the Bid. To this end, each Bid shall be supported by a statement of the Bidder’s experience as of recent date including: (a) all projects worked on by the Bidder over the past three (3) years including the contract amount for each project; (b) all complaints made against the Contractor’s license in the past ten (10) years; and (c) all claims and lawsuits presented or filed in the last five (5) years, regardless of the form, regarding any public works project.
11. **SUBMISSION OF BIDS.** The Bid shall be delivered by the time and to the place stipulated in the Notice Inviting Bids. It is the Bidder’s sole responsibility to see that its Bid is received in proper time and at the proper place.
12. **BID SECURITY, BONDS, AND INSURANCE.** Each Bid shall be accompanied by a certified or cashier’s check or approved Bid Bond in the amount stated in the Notice Inviting Bids. Said check or bond shall be made payable to the CITY and shall be given as a guarantee that the Bidder, if awarded the WORK, will enter into an Agreement with the CITY and will furnish the necessary insurance certificates, Payment Bond, and Performance Bond. In case of refusal or failure to enter into said Agreement, the check or Bid Bond, as the case may be, shall be forfeited to the CITY. If the Bidder elects to furnish a Bid Bond as its Bid security, the Bidder shall use the Bid Bond form bound herein. Bid Bonds shall comply with the requirements applicable to payment and performance bonds in the General Conditions.
- 12.1 **BIDDING CAPACITY.** Each Bid shall be accompanied by a list of the projects currently being worked on by Bidder, their size, contract price, scheduled completion date, location, and owner. Additionally, Bidder shall provide certified evidence of its current bonding capacity.
13. **DISCREPANCIES IN BIDS.** In the event there is more than one Bid item in a Bid Schedule, the Bidder shall furnish a price for all Bid Items in the Schedule, and failure to do so will render the Bid non-responsive and shall cause its rejection. In the event there are unit price Bid items in a Bidding schedule and the amount indicated for a unit price Bid item does not equal the product of the unit price and quantity, the unit price shall



govern and the amount will be corrected accordingly, and the BIDDER shall be bound by said correction. In the event there is more than one Bid item in a Bid Schedule and the total indicated for the Schedule does not agree with the sum of the prices Bid on the individual items, the prices Bid on the individual items shall govern and the total for the Schedule will be corrected accordingly, and the BIDDER shall be bound by said correction.

14. **MODIFICATIONS AND UNAUTHORIZED ALTERNATIVE BIDS.** Unauthorized conditions, limitations, or provisos attached to the Bid shall render it informal and may cause its rejection as being non-responsive. The Bid forms shall be completed without interlineations, alterations, or erasures in the printed text. Alternative Bids will not be considered unless called for. Oral, telegraphic, or telephonic Bids or modifications will not be considered.
15. **WITHDRAWAL OF BID.** The Bid may be withdrawn by the Bidder by means of a written request, signed by the Bidder or its properly authorized representative. Such written request must be delivered to the place stipulated in the Notice Inviting Bids for receipt of Bids prior to the scheduled closing time for receipt of Bids.
16. **BID PROTEST.** Any Bid protest must be submitted in writing to the City Manager before 5:00 p.m. on the fifth (5<sup>th</sup>) working day following Bid opening.
  - A. The initial protest document must contain a complete statement of the basis for the protest, and all supporting documentation.
  - B. The party filing the protest must have actually submitted a Bid for the WORK. A subcontractor of a party submitting a Bid for the WORK may not submit a Bid protest. A party may not rely on the Bid protest submitted by another Bidder, but must timely pursue its own protest.
  - C. The protest must refer to the specific portion of the bid document which forms the basis for the protest.
  - D. The protest must include the name, address and telephone number of the person representing the protesting party.
  - E. The party filing the protest must concurrently transmit a copy of the initial protest document and any attached documentation to all other parties with a direct financial interest which may be adversely affected by the outcome of the protest. Such parties shall include all other Bidders who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.
  - F. The CITY will give the protested Bidder five (5) working days after the receipt of the protest to submit a written response. The responding Bidder shall transmit the response to the protesting Bidder concurrent with delivery to the CITY.

- G. The procedure and time limits set forth in this paragraph are mandatory and are the Bidder's sole and exclusive remedy in the event of Bid protest. The Bidder's failure to comply with these procedures shall constitute a waiver of any right to further pursue the Bid protest, including filing a Government Code Claim or legal proceedings. A Bidder may not rely on a protest submitted by another Bidder, but must timely pursue its own protest.
- H. If the CITY determines that a protest is frivolous, the protesting bidder may be determined to be non-responsible and that bidder may be determined to be ineligible for future contract awards.
17. **AWARD OF CONTRACT.** Award of the contract, if awarded, will be made to the lowest responsive, responsible Bidder whose Bid complies with the requirements of the Contract Documents. Unless otherwise specified, any such award will be made within the period stated in the Notice Inviting Bids that the bids are to remain open. Unless otherwise indicated, a single award will be made for all the Bid items in an individual Bid Schedule. In the event the WORK is contained in more than one Bid Schedule, the CITY may award Schedules individually or in combination. In the case of two Bid Schedules which are alternative to each other, only one of such alternative schedules will be awarded. The CITY may condition the award upon the Bidder's timely submission of all items required by the Contract Documents, including, but not limited to the executed Agreement, performance, labor and materials, and maintenance bonds, and required certificates of insurance and endorsements.
18. **RETURN OF BID SECURITY.** Within 14 days after award of the contract, the CITY will, if requested, return the Bid securities accompanying such Bids that are not being considered in making the award. All other Bid securities will be held until the Agreement has been finally executed. They will then be returned, if requested, to the respective Bidders whose Bids they accompany.
19. **EXECUTION OF AGREEMENT.** The Bidder to whom award is made shall execute a written Agreement with the CITY on the form of agreement provided, shall secure all insurance, and shall furnish all certificates and bonds required by the Contract Documents within five (5) working days after receipt of Notice of Award from the CITY. Failure or refusal to enter into an Agreement as herein provided or to conform to any of the stipulated requirements in connection therewith shall be just cause for annulment of the award and forfeiture of the Bid security. If the lowest responsive, responsible Bidder refuses or fails to execute the Agreement, the CITY may award the Contract to the second lowest responsive, responsible Bidder. If the second lowest responsive, responsible Bidder refuses or fails to execute the Agreement, the OWNER may award the contract to the third lowest responsive, responsible Bidder. On the failure or refusal of such second or third lowest Bidder to execute the Agreement, each such Bidder's Bid securities shall be likewise forfeited to the CITY.
20. **LIQUIDATED DAMAGES.** Provisions for liquidated damages, if any, are set forth in the Agreement.

21. **WORKERS' COMPENSATION REQUIREMENT.** The Bidder should be aware that in accordance with Section 3700 of the California Labor Code it will, if awarded the Contract, be required to secure the payment of compensation to its employees and execute the Workers' Compensation Certification in the form contained in these Contract Documents.
22. **NON-COLLUSION AFFIDAVIT.** Bidders must execute the following affidavit and submit the same with his/her bid:
23. **MATERIALS SUPPLIERS LIST.** Bidders and their subcontractors must complete the List of Materials Suppliers and Material Guarantee form provided with the Bid Forms and must submit the completed form with the Bid.

END OF INSTRUCTIONS TO BIDDERS

BID PROPOSAL CERTIFICATE  
(if Corporation)

STATE OF CALIFORNIA )  
 ) ss:  
COUNTY OF )

I HEREBY CERTIFY that a meeting of the Board of Directors of the \_\_\_\_\_  
\_\_\_\_\_, a  
corporation existing under the laws of the State of \_\_\_\_\_, held on  
\_\_\_\_\_, 20\_\_\_, the following resolution was duly passed and adopted:

“RESOLVED, that \_\_\_\_\_, as \_\_\_\_\_  
President of the Corporation, be and is hereby authorized to execute the Bid  
Proposal dated \_\_\_\_\_, 20\_\_\_, for the \_\_\_\_\_  
\_\_\_\_\_ project, in the City of Petaluma, and that his/her  
execution thereof, attested by the Secretary of the Corporation, and with the  
Corporate Seal affixed, shall be the official act and deed of this Corporation.”

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of  
the corporation this \_\_\_\_\_, day of \_\_\_\_\_, 20\_\_\_.

\_\_\_\_\_  
Secretary

(SEAL)

BID PROPOSAL CERTIFICATE  
(if Partnership)

STATE OF CALIFORNIA    )  
                                                      ) ss:  
COUNTY OF                                    )

I HEREBY CERTIFY that a meeting of the Partners of the \_\_\_\_\_  
\_\_\_\_\_,  
a partnership existing under the laws of the State of \_\_\_\_\_, held  
on \_\_\_\_\_, 20\_\_\_\_, the following resolution was duly passed and adopted:

“RESOLVED, that \_\_\_\_\_, as the  
General Partner of the Partnership, be and is hereby authorized to execute the Bid  
Proposal dated \_\_\_\_\_, 20\_\_\_\_, for the \_\_\_\_\_  
project, in the City of Petaluma and that his/her execution thereof, attested by the  
\_\_\_\_\_ shall be the official act and deed of this Partnership.”

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this \_\_\_\_\_ day of  
\_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Partner

(SEAL)

BID PROPOSAL CERTIFICATE  
(if Joint Venture)

STATE OF CALIFORNIA )  
 ) ss:  
COUNTY OF )

I HEREBY CERTIFY that a meeting of the Principals of the \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ a joint venture existing under the laws of the State of \_\_\_\_\_,  
held on \_\_\_\_\_, 20\_\_\_\_, the following resolution was duly passed and adopted:

“RESOLVED, that \_\_\_\_\_, as  
\_\_\_\_\_ of the joint venture, be and is hereby authorized to  
execute the Bid Proposal dated \_\_\_\_\_, 20\_\_\_\_, for the \_\_\_\_\_  
\_\_\_\_\_ project, in the City of Petaluma, and  
that his/her execution thereof, attested by the \_\_\_\_\_ shall be the  
official act and deed of this Joint Venture.”

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this \_\_\_\_\_, day of  
\_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Managing Partner

(SEAL)

BID PROPOSAL CERTIFICATE  
(if Proprietorship)

STATE OF CALIFORNIA    )  
                                          ) ss:  
COUNTY OF                    )

I HEREBY CERTIFY that \_\_\_\_\_, as owner of  
\_\_\_\_\_ that I am authorized to execute the  
Bid Proposal dated \_\_\_\_\_, 20\_\_\_\_, for the \_\_\_\_\_  
\_\_\_\_\_ project, in the City of Petaluma, and that my execution  
thereof shall be the official act and deed of this proprietorship.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of  
the corporation this \_\_\_\_\_, day of \_\_\_\_\_, 20\_\_\_\_\_.

\_\_\_\_\_  
Owner

(SEAL)

## TABLE OF CONTENTS

### **SECTION    DESCRIPTION**

---

Notice Inviting Bids  
Instruction to Bidders

#### **I.            BID FORMS (To Be Submitted With Bids)**

Bidder's Affidavit of Non-Collusion  
Bid Proposal Certificate (if Corporation/if Partnership/if Joint Venture)  
Proposal  
Bid Schedule  
List of Subcontractors  
List of Materials, Suppliers and Material Guarantee  
Questionnaire and Financial Assurance Statement Form  
Site Visit Affidavit  
Bid Bond

#### **II.          GENERAL CONDITIONS**

Article 1:    Definitions  
Article 2:    Preliminary Matters  
Article 3:    Intent and Use of Contract Documents  
Article 4:    Site of the Work  
Article 5:    Bonds and Insurance  
Article 6:    Contractor's Responsibilities  
Article 7:    Other Work  
Article 8:    City's Responsibilities  
Article 9:    Engineer's Status During Construction  
Article 10:   Changes in the Work  
Article 11:   Change of Contract Price  
Article 12:   Change of Contract Times  
Article 13:   Inspections and Tests; Correction, Removal or Acceptance of  
                  Defective Work  
Article 14:   Payments to Contractor and Completion  
Article 15:   Suspension of Work and Termination  
Article 16:   General Terms  
Article 17:   California State Requirements

#### **III.         SPECIAL PROVISIONS**

3-1    Description of Work  
3-2    Order of Precedence of Contract Documents  
3-3    Cooperation  
3-4    Obstructions  
3-5    Maintaining Traffic



- 3-6 Watering
- 3-7 Progress Schedule
- 3-8 Superintendence
- 3-9 Safety Requirement
- 3-10 Project and Construction Area Signs
- 3-11 Project Appearance
- 3-12 Responsibility for Damage
- 3-13 Guarantee of Work
- 3-14 Notice to Proceed, Beginning of Work, Contract Time, Time of Completion, and Liquidated Damages
- 3-15 Hours of Work
- 3-16 Record (As-Built) Drawings
- 3-17 Notice of Potential Claim
- 3-18 Payment for Materials on Hand
- 3-19 Access to Driveways
- 3-20 Archaeological Monitoring
- 3-21 Biological Monitoring
- 3-22 Storm Water Management, and Sediment and Erosion Control
- 3-23 Item Increases and Decreases
- 3-24 Existing Water Valves, Monuments and Manholes
- 3-25 Wage Rates
- 3-26 Staging Area
- 3-27 Coordination with PG&E

#### **IV. TECHNICAL PROVISIONS**

DIVISION 02	EXISTING CONDITIONS
Section 02 0001	Site Conditions
Section 02 0003	Existing Utilities and Underground Structures
Section 02 0210	Site Preparation
Section 02 4100	Demolition and Salvage
DIVISION 03	CONCRETE
Section 03 1000	Concrete Forming
Section 03 2000	Concrete Reinforcing
Section 03 3000	Cast-in-Place Concrete
DIVISION 04	MASONRY
Section 04 2000	Concrete Unit Masonry
DIVISION 05	METAL WORK
Section 05 5000	Metal Fabrications
DIVISION 06 - 10	NOT USED
DIVISION 11	ATHLETIC EQUIPMENT
Section 11 6833	Outboard Tieback Backstop

Section 11 6840	Dugout Roof
DIVISION 12	SITE FURNISHINGS
Section 12 9300	Site Furnishings
DIVISION 13 - 25	NOT USED
DIVISION 26	ELECTRICAL
Section 26 0500	Basic Electrical Requirements
Section 26 0800	Testing
Section 26 2400	Service and Distribution System
Section 26 2700	Basic Electrical Materials and Methods
Section 26 5601	Site Lighting
DIVISION 27 - 30	NOT USED
DIVISION 31	EARTHWORK
Section 31 0000	Earthwork
Section 31 2333	Trenching and Backfill
DIVISION 32	EXTERIOR IMPROVEMENTS
Section 32 1000	Base Courses
Section 32 1216	Asphalt Paving
Section 32 1600	Curb, Gutter and Sidewalks
Section 32 1726	Tactile Warning Surfaces
Section 32 1813	Synthetic Turf System
Section 32 1814	Synthetic Landscape Turf System
Section 32 3113	Chain Link Fences and Gates
Section 32 8400	Irrigation System
Section 32 9000	Landscape Planting
DIVISION 33	UTILITIES
Section 33 4000	Storm Drainage Utilities
APPENDIX 1	Geotechnical Investigation Report
APPENDIX 2	Mocus Report
APPENDIX 3	Storm Water Pollution Prevention Plan Manual
APPENDIX 4	Wetlands Mitigation Plans

**V. CONSTRUCTION AGREEMENT**

Construction Agreement  
Faithful Performance Bond  
Labor and Materials Bond  
Maintenance Bond

**VI. PROJECT PLANS**

**BIDDER'S AFFIDAVIT OF NON-COLLUSION SUBMITTED WITH BID**

\_\_\_\_\_, [Contractor] hereby declares that:

He or she is \_\_\_\_\_ [title/position] of \_\_\_\_\_, [company name] the party making the foregoing bid; that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract or anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Dated: \_\_\_\_\_

\_\_\_\_\_  
Signature

Public Contract Code section 7106  
Code of Civil Procedure section 2015.5

END OF BIDDER'S AFFIDAVIT OF NON-COLLUSION SUBMITTED WITH BID

BID PROPOSAL CERTIFICATE  
(if Corporation)

STATE OF CALIFORNIA )  
                                                      ) ss:  
COUNTY OF                                  )

I HEREBY CERTIFY that a meeting of the Board of Directors of the \_\_\_\_\_,  
\_\_\_\_\_, a  
corporation existing under the laws of the State of \_\_\_\_\_, held on  
\_\_\_\_\_, 20\_\_\_\_, the following resolution was duly passed and adopted:

“RESOLVED, that \_\_\_\_\_, as \_\_\_\_\_  
President of the Corporation, be and is hereby authorized to execute the Bid  
Proposal dated \_\_\_\_\_, 20\_\_\_\_, for the \_\_\_\_\_  
\_\_\_\_\_ project, in the City of Petaluma, and that his/her  
execution thereof, attested by the Secretary of the Corporation, and with the  
Corporate Seal affixed, shall be the official act and deed of this Corporation.”

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of  
the corporation this \_\_\_\_\_, day of \_\_\_\_\_, 20\_\_\_\_\_.

\_\_\_\_\_  
Secretary

(SEAL)

BID PROPOSAL CERTIFICATE  
(if Partnership)

STATE OF CALIFORNIA    )  
                                                  ) ss:  
COUNTY OF                                )

I HEREBY CERTIFY that a meeting of the Partners of the \_\_\_\_\_  
\_\_\_\_\_,  
a partnership existing under the laws of the State of \_\_\_\_\_, held  
on \_\_\_\_\_, 20\_\_\_\_, the following resolution was duly passed and adopted:

“RESOLVED, that \_\_\_\_\_, as the  
General Partner of the Partnership, be and is hereby authorized to execute the Bid  
Proposal dated \_\_\_\_\_, 20\_\_\_\_, for the \_\_\_\_\_  
project, in the City of Petaluma and that his/her execution thereof, attested by the  
\_\_\_\_\_ shall be the official act and deed of this Partnership.”

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this \_\_\_\_\_ day of  
\_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Partner

(SEAL)

BID PROPOSAL CERTIFICATE  
(if Joint Venture)

STATE OF CALIFORNIA )  
 ) ss:  
COUNTY OF )

I HEREBY CERTIFY that a meeting of the Principals of the \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
a joint venture existing under the laws of the State of \_\_\_\_\_,  
held on \_\_\_\_\_, 20\_\_\_\_, the following resolution was duly passed and adopted:

“RESOLVED, that \_\_\_\_\_, as  
\_\_\_\_\_ of the joint venture, be and is hereby authorized to  
execute the Bid Proposal dated \_\_\_\_\_, 20\_\_\_\_, for the \_\_\_\_\_  
\_\_\_\_\_ project, in the City of Petaluma, and  
that his/her execution thereof, attested by the \_\_\_\_\_ shall be the  
official act and deed of this Joint Venture.”

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this \_\_\_\_\_, day of  
\_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Managing Partner

(SEAL)

BID PROPOSAL CERTIFICATE  
(if Proprietorship)

STATE OF CALIFORNIA )  
 ) ss:  
COUNTY OF )

I HEREBY CERTIFY that \_\_\_\_\_, as owner of \_\_\_\_\_ that I am authorized to execute the Bid Proposal dated \_\_\_\_\_, 20\_\_\_\_, for the \_\_\_\_\_ project, in the City of Petaluma, and that my execution thereof shall be the official act and deed of this proprietorship.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the corporation this \_\_\_\_\_, day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Owner

(SEAL)

# PROPOSAL

To the City Council of the City of Petaluma:

The undersigned declares that he/she has carefully examined the location of the proposed work, that he/she has examined the plans and specifications, and read the accompanying instructions to bidders, and hereby proposes to furnish all materials and do all the work required to complete the said work in accordance with said plans, specifications, and special provisions for the unit or lump sum prices set forth in the attached Bid Schedule.

It is understood and agreed that the undersigned shall complete the work of the contract within the time provided for in the Contract Documents and Specifications governing said work.

If awarded the contract, the undersigned hereby agrees to sign said contract and to furnish the necessary bonds, insurance certificates and agreements within five (5) working days after receipt of Notice of Award of said contract from the City.

The undersigned has examined the location of the proposed work and is familiar with the plans, specifications and other contract documents and the local conditions at the place where the work is to be done.

The undersigned has checked carefully all the figures on the attached Bid Schedule and understands that the City will not be responsible for any errors or omissions on the part of the undersigned in making up the bid.

Enclosed find bidder's bond, certified check, or cashier's check no. \_\_\_\_\_ of the \_\_\_\_\_ (Company) (Bank) for \_\_\_\_\_ Dollars (\$\_\_\_\_\_).

This project requires a Class A California State Contractor's License.

Contractor's License No. \_\_\_\_\_ License Class \_\_\_\_\_

Expiration Date of Contractor's License \_\_\_\_\_



This project requires registration with the California State Department of Industrial Relations.

Public Works Contractor Registration No. \_\_\_\_\_

Registration Date \_\_\_\_\_ Expiration Date \_\_\_\_\_

A bid submitted to a public agency by a contractor who is not licensed and not registered shall be considered non-responsive and shall be rejected by the public agency. The undersigned contractor declares that the contractor's license number, public work contractor registration number, and expiration dates stated herein are made under penalty of perjury under the laws of the State of California.

Contractor: \_\_\_\_\_

Signed by: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Phone: \_\_\_\_\_

Fax: \_\_\_\_\_

Email: \_\_\_\_\_

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

END OF PROPOSAL

**Bid Schedule**

**City of Petaluma  
Petaluma Community Sports Fields  
Baseball Diamond**

General Instructions to Bidders: The following sheets consist of the Base Bid. The bidder shall submit a bid proposal for the Base Bid in order for the bid to be valid and accepted by the Owner. The Basis for Award is the Base Bid.

**BASE BID**

<b>Item No.</b>	<b>Item Description</b>	<b>Estimated Quantity</b>	<b>Unit of Measure</b>	<b>Unit Cost</b>	<b>Item Total Cost</b>
001	Mobilization	1	LS		
002	Traffic Control	1	LS		
003	Erosion Control	1	LS		
004	Clearing and Demolition	1	LS		
005	Earthwork	13,760	CY		
006	Lime Treatment, 18"	22,790	SY		
007	Construction Staking	1	LS		
008	4" HDPE Storm Drain	109	LF		
009	6" HDPE Subdrain	2,020	LF		
010	6" HDPE Storm Drain	285	LF		
011	8" HDPE Storm Drain	325	LF		
012	12" Class V RCP Storm Drain	100	LF		
013	12" HDPE Storm Drain	115	LF		
014	12" Perforated HDPE Storm Drain	395	LF		
015	18" HDPE Storm Drain	870	LF		
016	24" HDPE Storm Drain	370	LF		
017	Catch Basin	3	EA		
018	Yard/Field Drain	5	EA		
019	Trench Drain	175	LF		
020	Storm Drain Cleanout	2	EA		
021	Storm Drain Concrete Inlet	2	EA		

<b>Item No.</b>	<b>Item Description</b>	<b>Estimated Quantity</b>	<b>Unit of Measure</b>	<b>Unit Cost</b>	<b>Item Total Cost</b>
022	24" Drop Inlet	2	EA		
023	36" Drop Inlet	1	EA		
024	12" Grate Inlet	1	EA		
025	18" Grate Inlet	1	EA		
026	24" Grate Inlet	1	EA		
027	12" Trench Drain Grate Inlet	4	EA		
028	12" Storm Drain Concrete Outfall	3	EA		
029	12" Storm Drain Outfall Flag Gate	1	EA		
030	24" Storm Drain Concrete Outfall	1	EA		
031	Sanitary Sewer Lateral	135	LF		
032	Water Service Lateral	1	EA		
033	Asphalt Concrete	445	TON		
034	Parking Lot Striping and Signage	1	LS		
035	Class II Aggregate Base	570	CY		
036	Concrete Swale	415	SF		
037	Concrete Curb and Gutter	1,310	LF		
038	Flush Curb	1,260	LF		
039	Pedestrian Concrete Pavement	8,065	SF		
040	Asphalt Pavement at Future Bleachers	200	TON		
041	Driven Concrete Pavement	8,900	SF		
042	Retaining Wall 8" wide	290	LF		
043	Retaining Wall 12"-14" wide	590	LF		
044	Synthetic Turf System	1	LS		
045	Brock PowerBase YSR	127,000	SF		
046	Synthetic Turf Field Drain Rock/Base Material	1,000	CY		
047	Synthetic Turf Field Permeable Class II Aggregate/Base Material	2,500	CY		
048	Field Section Geotextile Fabric	14,100	SY		
049	Field Section Stego Wrap Liner	2,140	SY		
050	Header Board	1,700	LF		

<b>Item No.</b>	<b>Item Description</b>	<b>Estimated Quantity</b>	<b>Unit of Measure</b>	<b>Unit Cost</b>	<b>Item Total Cost</b>
051	Lighting Conduit - Site	1	LS		
052	Lighting Conduit - Sports Field	1	LS		
053	Dugout Roof	2	EA		
054	CMU Wall at Dugout	150	LF		
055	Dugout Railing with Fence and Padding	4	EA		
056	Barrier Netting	390	LF		
057	Backstop (tie-back)	1	EA		
058	Foul Poles (Custom Left, Standard Right)	1	Set of 2		
059	Bases	1	LS		
060	Anchor Kit for Bases in Synthetic Turf	1	LS		
061	Backstop Pads	1	LS		
062	Chain Link Top Rail Cap	700	LF		
063	3' Chain Link Fencing	140	LF		
064	8' Chain Link Fencing	1,550	LF		
065	8' Chain Link Single Gate	4	EA		
066	8' Chain Link Single Maintenance Gate	1	EA		
067	8' Chain Link Gate in 12' Fence	2	EA		
068	8' Chain Link Double Entry Gate	3	EA		
069	8' Chain Link Dbl. Maintenance Gate	1	EA		
070	12' Chain Link Fencing	295	LF		
071	12' Chain Link Dbl. Maintenance Gate	1	EA		
072	Railing/Handrail	350	LF		
073	Flagpole	1	LS		
074	Removal of Lime Treatment for Planting	1	LS		
075	Soil Preparation	20,000	SF		
076	Mulch	325	CY		
077	Root Barrier	435	LF		
078	Irrigation System	20,000	SF		
079	Tree (24" box)	18	EA		

<b>Item No.</b>	<b>Item Description</b>	<b>Estimated Quantity</b>	<b>Unit of Measure</b>	<b>Unit Cost</b>	<b>Item Total Cost</b>
080	Bioretention Area	5,550	SF		
081	No Mow Sod	14,100	SF		
082	Shrubs (5 gallon)	77	EA		
083	Shrubs (1 gallon)	940	EA		
084	Landscape Maintenance Period	3	MONTH		
085	Wetlands Mitigation	1	LS		

TOTAL BASE BID \$

**BID ALTERNATE 1**

Item No.	Item Description	Estimated Quantity	Unit of Measure	Unit Cost	Item Total Cost
086	Lighting - Site	1	LS		
087	Lighting - Sports Field	1	LS		

**BID ALTERNATE 2**

Item No.	Item Description	Estimated Quantity	Unit of Measure	Unit Cost	Item Total Cost
088	Earthwork	1,740	CY		
089	Lime Treatment, 18"	2,770	SY		
090	18" HDPE Storm Drain	250	LF		
091	Catch Basin	2	EA		
092	Asphalt Concrete	440	TON		
093	Parking Lot Striping and Signage	1	LS		
094	Class II Aggregate Base	385	CY		
095	Concrete Swale	470	SF		
096	Concrete Curb and Gutter	1,495	LF		
097	Pedestrian Concrete Pavement	14,440	SF		
098	Concession Area Pavement Asphalt	120	TON		
099	Synthetic Landscape Turf System with Aggregate Base	3,800	SF		
100	Synthetic Landscape Turf Header	325	LF		
101	Lighting - Site	1	LS		
102	Soil Preparation	10,000	SF		
103	Root Barrier	480	LF		
104	Irrigation System	10,000	SF		
105	Tree (24" box)	10	EA		
106	No Mow Sod	2,500	SF		
107	Shrubs (15 gallon)	18	EA		
108	Shrubs (5 gallon)	90	EA		
109	Shrubs (1 gallon)	33	EA		
110	Landscape Maintenance Period	3	MONTH		

\*Note: In case of error in extension of price into the total price column, the unit price will govern.

Total Amount of Bid (written in words) is:	
_____	Dollars and
_____	Cents
In the event of discrepancy between words and figures, the words shall prevail.	
\$ _____	
Figures	

Note: **The award of the contract shall be awarded to the lowest price of the Base Bid.**

_____	_____
Address of Bidder	Signature of Bidder
_____	_____
City	Name of Bidder (Print)
_____	_____
Telephone Number of Bidder	Fax Number of Bidder
_____	_____
Contractor's License Number	License's Expiration Date

**Addendum Acknowledgement**

Addendum No. 1	Signature Acknowledging Receipt: _____	Date: _____
Addendum No. 2	Signature Acknowledging Receipt: _____	Date: _____
Addendum No. 3	Signature Acknowledging Receipt: _____	Date: _____
Addendum No. 3	Signature Acknowledging Receipt: _____	Date: _____

## LIST OF SUBCONTRACTORS

In accordance with Section 4104 of the Public Contracting Code of the State of California, each bidder shall list below the name and location of place of business of each subcontractor who will perform a portion of the contract work in an amount in excess of one-half of one percent of the total contract price or, in the cases of bids or offers for the construction of streets or highways, including bridges, in excess of one-half of 1 percent of the prime contractor’s total bid or ten thousand dollars (\$10,000), whichever is greater. In each such instance, the nature and extent of the work to be performed shall be described.

If a prime contractor fails to specify a subcontractor or if a prime contractor specifies more than one subcontractor for the same portion of work to be performed under the contract in excess of one-half of one percent of the prime contractor’s total bid, the prime contractor agrees that he or she is fully qualified to perform that portion himself or herself, and that the prime contractor shall perform that portion himself or herself. The subcontracting of work for which no subcontractor was designated in the original bid and which is in excess of one-half of one percent of the total contract price, will be allowed only with the written consent of the City.

Name of Subcontractor	Address of Office, Mill, or Shop	Description of Work to be Performed (also show Bid Schedule Item Number)	Public Works Contractor Registration Number
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**LIST OF MATERIAL SUPPLIERS AND MATERIAL GUARANTEE**

The bidder is required to name the make and supplier of the material items listed below to be furnished under these specifications. The bidder shall name a manufacturer for each item and the supplier of the item if the supplier is not the manufacturer. The naming of more than one supplier for a single item or naming a supplier followed by the words “or equal” will not be acceptable. Substitution of any listed supplier following submission of this form with the Bid shall only be permitted as authorized by the Engineer pursuant to Section 6.3 of the General Conditions.

Failure to complete this form and submit it with the bid proposal may cause the proposal to be rejected as being incomplete and not responsive to the solicitation.

<b>Item</b>	<b>Supplier &amp; Manufacturer</b>	<b>Address</b>

**MATERIAL GUARANTEE**

In addition to completion of the list of material suppliers on the Material Suppliers form, the bidder may be required to furnish prior to award of contract, a complete statement of the origin, composition and manufacturer of any or all materials to be used in the construction of the work, together with samples, which samples may be subjected to test, provided for in these specifications or in the Special Provisions to determine their quality and fitness for the work.

END OF  
LIST OF MATERIAL SUPPLIERS AND MATERIAL GUARANTEE

**QUESTIONNAIRE AND FINANCIAL ASSURANCE STATEMENT**

The following statements as to experience and financial qualifications of the Proposer are submitted in conjunction with the proposal as a part thereof, and the truthfulness and accuracy of the information is guaranteed by the Proposer.

The Proposer has been engaged in the contracting business under the present business for \_\_\_\_\_ years. Experience in work of a nature similar to that covered in the proposal extends over a period of \_\_\_\_\_ years.

The Proposer, as a contractor, has never failed to satisfactorily complete a contract awarded to contractor, except as follows:

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List all claims and lawsuits presented or filed in the last five (5) years, regardless of the form, regarding any public works project:

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The following contracts for work have been completed in the last three (3) years for the persons, firm or authority indicated and to whom reference is made:

<u>Year</u>	<u>Type of Work-Size, Length and Contract Amount</u>	<u>Location and For Whom Performed</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

The following complaints have been made against the Proposer's contractor's license within the past ten (10) years:

Date: \_\_\_\_\_ Nature of Complaint \_\_\_\_\_

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Reference is hereby made to the following bank or banks as to the financial responsibility of the proposer:

NAME OF BANK	ADDRESS

Reference is hereby made to the following surety companies as to the financial responsibility and general reliability of the proposer:

NAME OF SURETY COMPANY:

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I, the undersigned, declare under penalty of perjury under the laws of the State of California, that the foregoing is true and correct.

\_\_\_\_\_  
SIGNATURE OF PROPOSER

\_\_\_\_\_  
DATE

\_\_\_\_\_  
NAME OF PROPOSER

END OF  
QUESTIONNAIRE AND FINANCIAL STATEMENT FORM

**BID BOND**

We, \_\_\_\_\_ as Principal, and \_\_\_\_\_ as Surety, jointly and severally, bind ourselves, our heirs, representatives, successors and assigns, as set forth herein, to the City of Petaluma (herein called "the Owner") for the payment of the penal sum of \_\_\_\_\_ Dollars (\$\_\_\_\_\_), lawful money of the United States, which is ten (10) percent of the total amount bid by bidder to the Owner. Principal has submitted the accompanying bid for the construction of the \_\_\_\_\_ project.

If the Principal is awarded the contract and enters into a written contract, in the form prescribed by the Owner, at the price designated by his bid, and files the bonds required by the Agreement with the Owner, and carries all insurance in type and amount which conforms to the contract documents and furnishes required certificates and endorsements thereof, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Forfeiture of this bond, or any deposit made in lieu thereof, shall not preclude the Owner from seeking all other remedies provided by law to cover losses sustained as a result of the Principal's failure to do any of the foregoing.

Principal and Surety agree that if the Owner is required to engage the services of an attorney in connection with the enforcement of this bond, each shall pay the Owner's reasonable attorney's fees, witness fees and other costs incurred with or without suit.

Executed on \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
PRINCIPAL

By \_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

Any claims under this bond may be addressed to:

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(Name and address of Surety's agent for service of process in California, if different from above)

(Telephone number of Surety's agent in California)

(Attach Acknowledgment)

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SURETY

By \_\_\_\_\_  
(Attorney-in-Fact)

**NOTICE:**

No substitution or revision to this bond form will be accepted. Be sure that all bonds submitted have a certified copy of the bonding agent's power of attorney attached. Also verify that Surety is an "Admitted Surety" (i.e., qualified to do business in California), and attach proof of verification (website printout from the California Department of Insurance website (<http://www.insurance.ca.gov/docs/index.html>) or certificate from County Clerk).

END OF BID BOND

**SECTION II**  
**GENERAL CONDITIONS**

**CITY OF PETALUMA - GENERAL CONDITIONS**

TABLE OF CONTENTS

ARTICLE 1 - DEFINITIONS ..... 1

    Addenda..... 1

    Agreement ..... 1

    Application for Payment..... 1

    Asbestos..... 1

    Bid ..... 1

    Bonds..... 1

    Change Order..... 1

    CITY..... 1

    Clarification..... 1

    Contract Documents ..... 1

    Contract Price ..... 2

    Contract Times ..... 2

    CONTRACTOR..... 2

    Day ..... 2

    Defective Work..... 2

    Drawings..... 2

    Effective Date of the Agreement ..... 2

    ENGINEER ..... 2

    Field Order..... 2

    Hazardous Waste ..... 2

    Laws and Regulations; Laws or Regulations ..... 2

    Lien or Mechanic’s Lien..... 2

    Milestone ..... 3

    Notice of Award ..... 3

    Notice of Completion ..... 3

    Notice to Proceed..... 3

    Partial Utilization..... 3

    Petroleum..... 3

    Project..... 3

    Record Drawings ..... 3

    Resident Project Representative ..... 3

    Samples..... 3

    Shop Drawings ..... 3

    Site..... 3

    Special Provisions ..... 4

    Specifications ..... 4

    Stop Notice ..... 4

    Subcontractor..... 4



Supplementary General Conditions.....	4
Supplier.....	4
Utilities .....	4
WORK.....	4
Working day .....	4
ARTICLE 2 - PRELIMINARY MATTERS .....	4
2.1 DELIVERY OF BONDS AND INSURANCE CERTIFICATES.....	4
2.2 COPIES OF DOCUMENTS.....	5
2.3 COMMENCEMENT OF CONTRACT TIMES; NOTICE TO PROCEED .....	5
2.4 STARTING THE WORK.....	5
2.5 PRECONSTRUCTION CONFERENCE .....	5
ARTICLE 3 - INTENT AND USE OF CONTRACT DOCUMENTS .....	5
3.1 INTENT .....	5
3.2 REFERENCE TO STANDARDS.....	6
3.3 REVIEW OF CONTRACT DOCUMENTS.....	6
3.4 ORDER OF PRECEDENCE OF CONTRACT DOCUMENTS.....	7
3.5 AMENDING CONTRACT DOCUMENTS.....	7
3.6 REUSE OF DOCUMENTS .....	7
ARTICLE 4 - SITE OF THE WORK.....	8
4.1 AVAILABILITY OF LANDS.....	8
4.2 REPORTS OF PHYSICAL CONDITIONS .....	8
4.3 PHYSICAL CONDITIONS - UNDERGROUND UTILITIES.....	9
4.4 DIFFERING SITE CONDITIONS .....	9
4.5 HAZARDOUS MATERIALS .....	10
4.6 REFERENCE POINTS.....	11
ARTICLE 5 - BONDS AND INSURANCE .....	11
5.1 BONDS .....	11
5.2 INSURANCE.....	12
ARTICLE 6 - CONTRACTOR’S RESPONSIBILITIES.....	15
6.1 COMMUNICATIONS.....	15
6.2 SUPERVISION AND SUPERINTENDENCE .....	15
6.3 LABOR, MATERIALS, AND EQUIPMENT.....	15
6.4 SCHEDULE.....	20
6.5 SUBSTITUTES OR “OR EQUAL” ITEMS .....	20
6.6 CONCERNING SUBCONTRACTORS, SUPPLIERS, AND OTHERS.....	20
6.7 PERMITS.....	20
6.8 PATENT FEES AND ROYALTIES .....	20
6.9 LAWS AND REGULATIONS.....	21
6.10 TAXES.....	21
6.11 USE OF PREMISES.....	21
6.12 SAFETY AND PROTECTION .....	22

6.13	EMERGENCIES.....	24
6.14	SUBMITTALS.....	24
6.15	CONTINUING THE WORK.....	27
6.16	CONTRACTOR’S GENERAL WARRANTY AND GUARANTEE .....	27
6.17	INDEMNIFICATION.....	29
6.18	CONTRACTOR’S DAILY REPORTS .....	31
6.19	CONTRACT DOCUMENTS AND RECORD DRAWINGS.....	31
6.20	CLEAN UP .....	32
6.21	STORM WATER POLLUTION PREVENTION .....	33
ARTICLE 7 - OTHER WORK.....		39
7.1	RELATED WORK AT SITE.....	39
7.2	COORDINATION .....	40
ARTICLE 8 - CITY’S RESPONSIBILITIES .....		40
8.1	COMMUNICATIONS.....	40
8.2	PAYMENTS .....	40
8.3	LANDS, EASEMENTS, AND SURVEYS .....	40
8.4	REPORTS AND DRAWINGS .....	40
8.5	CHANGE ORDERS .....	40
8.6	INSPECTIONS AND TESTS.....	40
8.7	SUSPENSION OF WORK .....	40
8.8	TERMINATION OF AGREEMENT .....	41
8.9	LIMITATION ON CITY’S RESPONSIBILITIES .....	41
8.10	UNDISCLOSED HAZARDOUS ENVIRONMENTAL CONDITIONS .....	41
ARTICLE 9 - ENGINEER’S STATUS DURING CONSTRUCTION .....		42
9.1	CITY’S REPRESENTATIVE .....	42
9.2	OBSERVATIONS ON THE SITE .....	42
9.3	PROJECT REPRESENTATION .....	42
9.4	CLARIFICATIONS.....	42
9.5	AUTHORIZED VARIATIONS IN WORK.....	42
9.6	REJECTING DEFECTIVE WORK .....	43
9.7	CONTRACTOR SUBMITTALS, CHANGE ORDERS, AND PAYMENTS.....	43
9.8	DECISIONS ON DISPUTES .....	43
9.9	LIMITATIONS ON ENGINEER’S RESPONSIBILITIES.....	43
ARTICLE 10 - CHANGES IN THE WORK .....		44
10.1	GENERAL .....	44
10.2	ALLOWABLE QUANTITY VARIATIONS.....	45
ARTICLE 11 - CHANGE OF CONTRACT PRICE.....		45
11.1	GENERAL .....	45
11.2	COSTS RELATING TO WEATHER .....	46
11.3	COST OF WORK (BASED ON TIME AND MATERIALS) .....	46
11.4	CONTRACTOR’S OVERHEAD AND PROFIT.....	50

11.5	EXCLUDED COSTS.....	50
11.6	CONTRACTOR’S EXTRA WORK REPORT .....	51
ARTICLE 12 - CHANGE OF CONTRACT TIMES .....		52
12.1	GENERAL .....	52
12.2	EXTENSIONS OF CONTRACT TIMES FOR DELAY DUE TO WEATHER. 53	
ARTICLE 13 - INSPECTIONS AND TESTS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK .....		53
13.1	NOTICE OF DEFECTIVE WORK.....	53
13.2	ACCESS TO WORK .....	53
13.3	INSPECTIONS AND TESTS.....	53
13.4	CITY MAY STOP THE WORK .....	55
13.5	CORRECTION OR REMOVAL OF DEFECTIVE WORK.....	55
13.6	ACCEPTANCE OF DEFECTIVE WORK .....	55
13.7	CITY MAY CORRECT DEFECTIVE WORK.....	56
13.8	CORRECTION PERIOD.....	56
ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION.....		57
14.1	SCHEDULE OF VALUES (LUMP SUM PRICE BREAKDOWN).....	57
14.2	UNIT PRICE BID SCHEDULE .....	57
14.3	APPLICATION FOR PROGRESS PAYMENT .....	57
14.4	CONTRACTOR’S WARRANTY OF TITLE.....	58
14.5	REVIEW OF APPLICATIONS FOR PROGRESS PAYMENT .....	58
14.6	COMPLETION.....	60
14.7	PARTIAL UTILIZATION.....	61
14.8	FINAL APPLICATION FOR PAYMENT.....	61
14.9	FINAL PAYMENT AND ACCEPTANCE.....	61
ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION .....		63
15.1	SUSPENSION OF WORK BY CITY .....	63
15.2	TERMINATION OF AGREEMENT BY ENGINEER FOR DEFAULT.....	63
15.2	TERMINATION OF AGREEMENT BY CITY FOR CONVENIENCE .....	64
15.4	TERMINATION OF AGREEMENT BY CONTRACTOR.....	64
ARTICLE 16 - GENERAL TERMS .....		65
16.1	GIVING NOTICE.....	65
16.2	TITLE TO MATERIALS FOUND ON THE WORK.....	65
16.3	RIGHT TO AUDIT.....	65
16.4	SURVIVAL OF OBLIGATIONS.....	66
16.5	CONTROLLING LAW .....	66
16.6	SEVERABILITY .....	66
16.7	WAIVER.....	66
ARTICLE 17 - CALIFORNIA STATE REQUIREMENTS.....		67
17.1	STATE WAGE DETERMINATIONS .....	67

17.2	WORKERS' COMPENSATION.....	67
17.3	APPRENTICES ON PUBLIC WORKS.....	67
17.4	WORKING HOURS.....	68
17.5	CONTRACTOR NOT RESPONSIBLE FOR DAMAGE RESULTING FROM CERTAIN ACTS OF GOD.....	68
17.6	NOTICE OF COMPLETION.....	68
17.7	UNPAID CLAIMS.....	68
17.8	RETAINAGE FROM MONTHLY PAYMENTS.....	69
17.9	PUBLIC WORKS CONTRACTS; ASSIGNMENT TO AWARDING BODY...	69
17.10	PAYROLL RECORDS; RETENTION; INSPECTION, NONCOMPLIANCE PENALTIES; RULES AND REGULATIONS.....	70
17.11	CULTURAL RESOURCES.....	71
17.12	PROTECTION OF WORKERS IN TRENCH EXCAVATIONS.....	71
17.13	CONCRETE FORMS, FALSEWORK, AND SHORING.....	72
17.14	REMOVAL, RELOCATION, OR PROTECTION OF EXISTING UTILITIES.	72
17.15	CONTRACTOR LICENSE REQUIREMENTS.....	73
17.16	DIGGING TRENCHES OR EXCAVATIONS; NOTICE ON DISCOVERY OF HAZARDOUS WASTE OR OTHER UNUSUAL CONDITIONS; INVESTIGATIONS; CHANGE ORDERS' EFFECT ON CONTRACT.....	74
17.17	RETENTION PROCEEDS; WITHHOLDING; DISBURSEMENT.....	75
17.18	TIMELY PROGRESS PAYMENTS; INTEREST; PAYMENT REQUESTS ....	77
17.19	PREFERENCE FOR MATERIAL.....	77
17.20	RESOLUTION OF CONSTRUCTION CLAIMS.....	78

## ARTICLE 1 - DEFINITIONS

Whenever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated in this Article 1 which meanings are applicable to both the singular and plural thereof. If a word which is entirely in upper case in these definitions is found in lower case in the Contract Documents, then the lower case word will have its ordinary meaning.

**Addenda** - Written or graphic instruments issued prior to the opening of Bids which make additions, deletions, or revisions to the Contract Documents.

**Agreement** - The written contract between the CITY and the CONTRACTOR covering the WORK to be performed; other documents are attached to the Agreement and made a part thereof as provided therein.

**Application for Payment** - The form accepted by the ENGINEER which is to be used by the CONTRACTOR to request progress payments or final payment and which is to be accompanied by such supporting documentations as is required by the Contract Documents.

**Asbestos** - Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

**Bid** - The offer or proposal of the bidder submitted on the prescribed form setting forth the price or prices for the WORK.

**Bonds** - Bid, Performance, and Labor and Materials, and Maintenance Bonds and other instruments of security.

**Change Order** - A document recommended by the ENGINEER, which is signed by the CONTRACTOR and the CITY, and authorizes an addition, deletion, or revision in the WORK, or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

**CITY** - The City of Petaluma.

**Clarification** - A document issued by the ENGINEER to the CONTRACTOR that clarifies the requirements(s) and/or design intent of the Contract Documents, which may not represent an addition, deletion, or revision in the WORK or an adjustment in the Contract Price or the Contract Times.

**Contract Documents** - The Notice Inviting Bids, Instructions to Bidders, Bid Forms (including the Bid, Bid Schedule(s), Information Required of Bidder, Bid Bond, and all required certificates, affidavits and other documentation), Agreement, Performance Bond, Labor and Materials Bond, Maintenance Bond, General Conditions, any Supplementary General

Conditions, Special Provisions, Specifications, Drawings, all Addenda, and Change Orders executed pursuant to the provisions of the Contract Documents. Shop Drawings are not Contract Documents.

**Contract Price** - The total monies payable by the CITY to the CONTRACTOR under the terms and conditions of the Contract Documents.

**Contract Times** - The number or numbers of successive calendar days or dates stated in the Contract Documents for the completion of the WORK.

**CONTRACTOR** - The individual, partnership, corporation, joint-venture, or other legal entity with whom the CITY has executed the Agreement.

**Day** - A calendar day of 24 hours measured from midnight to the next midnight.

**Defective Work** - Work that is unsatisfactory, faulty, or deficient; or that does not conform to the Contract Documents; or that does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents; or work that has been damaged prior to the ENGINEER's recommendation of final payment.

**Drawings** - The drawings, plans, maps, profiles, diagrams, and other graphic representations which indicate the character, location, nature, extent, and scope of the WORK and which have been prepared by the ENGINEER and are included and/or referred to in the Contract Documents. Shop Drawings are not Drawings as so defined.

**Effective Date of the Agreement** - The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

**ENGINEER** - The City Manager or his/her designee.

**Field Order** - A written order issued by the ENGINEER which may or may not involve a change in the WORK.

**Hazardous Waste** - The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 U.S.C. Section 6906) as amended from time to time.

**Laws and Regulations; Laws or Regulations** - Any and all applicable laws, rules, regulations, ordinances, codes, and/or orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

**Lien or Mechanic's Lien** - A form of security, an interest in real property, which is held to secure the payment of an obligation. When related to public works construction, Lien or Mechanic's Lien may be called Stop Notice.

**Milestone** - A principal event specified in the Contract Documents relating to an intermediate completion date of a separately identifiable part of the WORK or a period of time within which the separately identifiable part of the WORK should be performed prior to completion of all the WORK.

**Notice of Award** - The written notice by the CITY to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein within the time specified, the CITY will enter into an Agreement.

**Notice of Completion** - A form signed by the ENGINEER and the CONTRACTOR recommending to the CITY that the WORK is Complete and fixing the date of completion. After acceptance of the WORK by the CITY Council, the form is signed by the CITY and filed with the County Recorder. This filing starts the 30 day lien filing period on the WORK.

**Notice to Proceed** - The written notice issued by the CITY to the CONTRACTOR authorizing the CONTRACTOR to proceed with the WORK for the purpose for which it is intended prior to completion of all the WORK.

**Partial Utilization** - Use by the CITY of a completed part of the WORK for the purpose for which it is intended prior to completion of all the WORK.

**Petroleum** - Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Wastes and crude oils.

**Project** - The total construction project of which the WORK to be provided under the Contract Documents may be the whole, or as part as indicated elsewhere in the Contract Documents.

**Record Drawings** - Drawings generated by marking a set of Drawings to reflect all of the changes that have occurred during construction of the Project.

**Resident Project Representative** - The authorized representative of the ENGINEER who is assigned to the Site or any part thereof.

**Samples** - Physical examples of materials, equipment, or workmanship that are representative of some portion of the WORK and which establish the standards by which such portion of the WORK will be judged.

**Shop Drawings** - All drawings, diagrams, illustrations, schedules, and other data which are specifically prepared by or for the CONTRACTOR and submitted by the CONTRACTOR to illustrate some portion of WORK.

**Site** - Lands or other areas designated in the Contract Documents as being furnished by the CITY for the performance of the construction, storage, or access.

**Special Provisions** - Specific clauses setting forth conditions or requirements peculiar to the work and supplementary to the Standard Specifications.

**Specifications** - The directions, provisions and requirements set forth in the Standard Specifications as supplemental and modified by the special provisions.

**Stop Notice** - A legal remedy for subcontractors and suppliers who contribute to public works, but who are not paid for their work, which secures payment from construction funds possessed by the CITY. In some states, for public property, the Stop Notice remedy is designed to substitute for a mechanic's lien.

**Subcontractor** - An individual, partnership, corporation, joint-venture, or other legal entity having a direct contract with the CONTRACTOR or with any other subcontractor for the performance of a part of the WORK at the Site.

**Supplementary General Conditions** - The part of the Contract Documents which make additions, deletions, or revisions to these General Conditions.

**Supplier** - A manufacturer, fabricator, distributor, materialman, or vendor having a direct contract with the CONTRACTOR or with any Subcontractor to furnish materials, equipment, or product to be incorporated in the WORK by the CONTRACTOR or any Subcontractor.

**Utilities** - All pipelines, conduits, ducts, cables, wires, tracks, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities which have been installed underground or above the ground to furnish any of the following services or materials; water, sewage, sludge, drainage, fluids, electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, traffic control, or other control systems.

**WORK** - The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. WORK is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.

**Working day** - Any day except Saturdays, Sundays and CITY holidays.

## **ARTICLE 2 – PRELIMINARY MATTERS**

### **2.1 DELIVERY OF BONDS AND INSURANCE CERTIFICATES**

- A. When the CONTRACTOR delivers the signed Agreement to the CITY, the CONTRACTOR shall also deliver to the CITY such Bonds and insurance policies and certificates as the CONTRACTOR may be required to furnish in accordance with the Contract Documents.



## 2.2 COPIES OF DOCUMENTS

- A. The CITY will furnish to the CONTRACTOR the required number of copies of the Contract Documents specified in the Supplementary General Conditions.

## 2.3 COMMENCEMENT OF CONTRACT TIMES; NOTICE TO PROCEED

- A. The Contract Times will start to run on the commencement date stated in the Notice to Proceed.

## 2.4 STARTING THE WORK

- A. The CONTRACTOR shall begin to perform the WORK on the commencement date stated in the Notice to Proceed, but no work shall be done at the Site prior to said commencement date.
- B. Before undertaking each part of the WORK, the CONTRACTOR shall review the Contract Documents in accordance with Paragraph 3.3.

## 2.5 PRECONSTRUCTION CONFERENCE

- A. The CONTRACTOR is required to attend a preconstruction conference. This conference will be attended by the CITY, ENGINEER, and others as appropriate in order to discuss the WORK.
- B. The CONTRACTOR's initial schedule submittals for shop drawings, obtaining permits, and Plan of Operation and CPM Schedule will be reviewed and finalized. At a minimum, the CONTRACTOR's representatives shall include its project manager, project superintendent and schedule expert. If the submittals are not finalized at the end of the meeting, additional meetings will be held so that the submittals can be finalized prior to the submittal of the first Application for Payment. No Application for Payment will be processed prior to receiving acceptable initial submittals from the CONTRACTOR.

# ARTICLE 3 – INTENT AND USE OF CONTRACT DOCUMENTS

## 3.1 INTENT

- A. The Contract Documents comprise the entire agreement between the CITY and the CONTRACTOR concerning the WORK. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the State of California .
- B. It is the intent of the Contract Documents to describe the WORK, functionally complete, to be constructed in accordance with the Contract Documents. Any

labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not called for specifically.

- C. When words or phrases which have a well-known technical or construction industry or trade meaning are used to describe work, materials, or equipment such words or phrases shall be interpreted in accordance with that meaning unless a definition has been provided in Article 1 of the General Conditions.

### 3.2 REFERENCE TO STANDARDS

- A. Reference to standard specifications, manuals, or codes of any technical society, organization, or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code shall be effective to change the duties and responsibilities of the CITY or the CONTRACTOR or any of their consultants, agents or employees, from those set forth in the CONTRACT Documents, nor shall it be effective to assign to CITY any duty or authority to direct the performance of the WORK or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

### 3.3 REVIEW OF CONTRACT DOCUMENTS

- A. If, during the performance of the WORK, CONTRACTOR discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such Law or Regulation applicable to the performance of the WORK or of any such standard, specification, manual, or code, or of any instruction of any Supplier, CONTRACTOR shall report it to ENGINEER in writing at once, and CONTRACTOR shall not proceed with the work affected thereby (except in an emergency as authorized by Paragraph 6.13 until a Clarification, Field Order, or Change Order to the Contract Documents has been issued.

### 3.4 ORDER OF PRECEDENCE OF CONTRACT DOCUMENTS

A. Unless otherwise noted herein, conflicts or inconsistencies between parts of the Contract will be resolved by the ENGINEER with a Change Order or an Addendum, if required. Addenda and Change Orders bearing the most recent date shall prevail over Addenda or Change Orders bearing earlier dates. Any reference to addenda-changed specifications or drawings shall be considered to have been changed accordingly. In resolving conflicts resulting from errors or discrepancies in any of the Contract Documents, the order of precedence shall be as follows:

1. Change Orders/Addenda (most recent in time take precedence)
2. Agreement and Bond Forms
3. Referenced Standard Specifications
4. Special Provisions
5. Drawings
6. General Conditions
7. Instructions to Bidders
8. Contractor's Bid (Bid Form)
9. Notice Inviting Bids
10. Supplementary General Conditions (if any)
11. Permits from other agencies as may be required by law

B. With reference to the Drawings the order of precedence is as follows:

1. Figures govern over scaled dimensions
2. Detail drawings govern over general drawings
3. Addenda/Change Order drawings govern over any other drawings
4. Drawings govern over standard drawings

### 3.5 AMENDING CONTRACT DOCUMENTS

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the WORK or to modify the terms and conditions thereof by a Change Order (pursuant to Article 10).

### 3.6 REUSE OF DOCUMENTS

A. Neither the CONTRACTOR, nor any Subcontractor or Supplier, nor any other person or organization performing any of the WORK under a contract with the CITY shall have or acquire any title to or ownership rights in any of the Drawings, Technical Specifications, or other documents used on the WORK, and they shall no reuse any of them on the extensions of the Project or any other project without written consent of CITY.

## ARTICLE 4 – SITE OF THE WORK

### 4.1 AVAILABILITY OF LANDS

- A. The CITY will furnish, as indicated in the Contract Documents, the lands upon which the WORK is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for the use of the CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by the CITY, unless otherwise provided in the Contract Documents. Nothing contained in the Contract Documents shall be interpreted as giving the CONTRACTOR exclusive occupancy of the lands or rights-of-way provided. The CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment; provided, that the CONTRACTOR shall not enter upon nor use any property not under the control of the CITY until a written temporary construction easement agreement has been executed by the CONTRACTOR and the property owner, and a copy of said easement furnished to the ENGINEER prior to said use; and the CITY will not be liable for any claims or damages resulting from the CONTRACTOR's trespass on or use of any such properties. The CONTRACTOR shall provide the CITY with a signed release from the property owner confirming that the lands have been satisfactorily restored upon completion of the WORK.

### 4.2 REPORTS OF PHYSICAL CONDITIONS

- A. **Subsurface Explorations:** Reference is made to any Supplementary General Conditions for identification of those reports of explorations and tests of subsurface conditions at the Site that have been utilized by the ENGINEER in the preparation of the Contract Documents.
- B. **Existing Structures:** Reference is made to any Supplementary General Conditions for identification of those drawings of physical conditions in or relating to existing surface and subsurface structures (except underground Utilities referred to in Paragraph 4.3 herein) which are at or contiguous to the Site that have been utilized in the preparation of the Contract Documents.
- C. The CITY makes no representation as to the completeness of the reports or drawings referred to in Paragraph 4.2 A or B above or the accuracy of any data or information contained therein. The CONTRACTOR may rely upon the accuracy of the technical data contained in such reports and drawings. However, the CONTRACTOR may not rely upon any interpretation of such technical data, including any interpolation or extrapolation thereof, or any non-technical data, interpretations, and opinions contained therein.

#### 4.3 PHYSICAL CONDITIONS - UNDERGROUND UTILITIES

- A. **Indicated:** The information and data indicated in the Contract Documents with respect to existing underground Utilities at or contiguous to the Site are based on information and data furnished to the CITY or the ENGINEER by the owners of such underground Utilities or by others. Unless it is expressly provided in any Supplementary General Conditions the CITY will not be responsible for the accuracy or completeness of any such information or data, and the CONTRACTOR shall have full responsibility for reviewing and checking all such information and data, for locating all underground Utilities indicated in the Contract Documents, for coordination of the WORK with the owners of such underground Utilities during construction, for the safety and protection thereof and repairing any damage thereto resulting from the WORK, the cost of all of which are deemed to have been included in the Contract Price.
- B. **Not Indicated:** If an underground Utility is uncovered or revealed at or contiguous to the Site which was not indicated in the Contract Documents and which the CONTRACTOR could not reasonably have been expected to be aware of, the CONTRACTOR shall identify the owner of such underground Utility and give written notice thereof to that owner and shall notify the ENGINEER.

#### 4.4 DIFFERING SITE CONDITIONS

- A. The CONTRACTOR shall notify the ENGINEER, in writing, of the following unforeseen conditions, hereinafter called differing Site conditions, promptly upon their discovery (but in no event later than 14 days after their discovery) and before they are disturbed:
  - 1. Subsurface or latent physical conditions at the Site of the WORK differing materially from those indicated, described, or delineated in the Contract Documents, including those reports discussed in Paragraph 4.2, 4.3, and 4.5.
- B. The ENGINEER will review the pertinent conditions, determine the necessity of obtaining additional explorations or tests with respect thereto.
- C. If the ENGINEER concludes that because of newly discovered conditions a change in the Contract Documents is required, a Change Order will be issued as provided in Article 10 to reflect and document the consequences of the difference.
- D. In each such case, an increase or decrease in the Contract Price or an extension or shortening the Contract Times, or any combination thereof, will be allowable to the extent that they are attributable to any such difference. If the ENGINEER and the CONTRACTOR are unable to agree as to the amount or length thereof, a claim may be made therefor as provided in Articles 11 and 12.

- E. The CONTRACTOR's failure to give notice of differing Site conditions within 14 days of their discovery and before they are disturbed shall constitute a waiver of all claims in connection therewith, whether direct or consequential in nature.

#### 4.5 HAZARDOUS MATERIALS

- A. CITY shall be responsible for any Asbestos, Hazardous Waste, Petroleum, or Radioactive Material uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the WORK and which may present a substantial danger to persons or property exposed thereto in connection with the WORK at the Site. CITY will not be responsible for any such material brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible.
  - 1. Upon discovery of any Asbestos, Hazardous Waste, Petroleum, or Radioactive Material, the CONTRACTOR shall immediately stop all work in any area affected thereby (except in an emergency as required by Paragraph 6.13) and notify ENGINEER (and therefore confirm such notice in writing). CONTRACTOR shall not be required to resume any work in any such affected area until after CITY has obtained any required permits related thereto and delivered to CONTRACTOR special written notice. Such written notice will specify that such condition and any affected area is or has been rendered safe for the resumption of the work or specify any special conditions under which the work may be resumed safely. If ENGINEER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of adjustment, if any, in Contract Price or Contract Times as a result of such work stoppage or such special conditions under which work is agreed by CONTRACTOR to be resumed, either party may make a claim therefor as provided in Articles 11 and 12.
  - 2. If, after receipt of such special written notice, CONTRACTOR does not agree to resume such WORK based on a reasonable belief it is unsafe, or does not agree to resume such WORK under special conditions, ENGINEER may order such portion of the WORK that is in connection with such hazardous condition or in such affected area to be deleted from the WORK. If ENGINEER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of deleting such portion of the WORK then either party may make a claim therefor as provided in Articles 11 and 12. CITY may have such deleted portion of the WORK performed by CITY's own forces or others in accordance with Article 7.
- B. The provisions of Paragraphs 4.2, 4.3, and 4.4 are not intended to apply to Asbestos, Petroleum, Hazardous Waste, or Radioactive Material uncovered or revealed at the Site.

#### 4.6 REFERENCE POINTS

- A. The ENGINEER will provide the location and elevation of one bench mark, near or on the Site of the WORK, for use by the CONTRACTOR for alignment and elevation control. Unless otherwise specified in any Supplementary General Conditions, the CONTRACTOR shall furnish all other lines, grades, and bench marks required for proper execution of the WORK.
- B. The CONTRACTOR shall preserve or replace any and all bench marks, section corners, witness corners, stakes, and other survey marks, and in case of their removal or destruction by any party, the CONTRACTOR shall be responsible for the accurate replacement of such reference points by surveyor licensed under the applicable state codes governing land surveyors.

### ARTICLE 5 – BONDS AND INSURANCE

#### 5.1 BONDS

- A. The CONTRACTOR shall furnish Performance and Labor and Materials Bonds, each in the amount of one hundred percent (100%) of the contract price, as security for the faithful performance and payment of all the CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date of completion, except as otherwise provided by Law or Regulation or by the Contract Documents. The CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary General Conditions.
- B. The CONTRACTOR shall guarantee the WORK to be free of defects in material and workmanship for a period of one (1) year following the CITY's acceptance of the WORK. The CONTRACTOR shall agree to make, at the CONTRACTOR's own expense, any repairs or replacements made necessary by defects in material or workmanship which become evident within the one-year guarantee period. The CONTRACTOR's guarantee against defects required by this provision shall be secured by a Maintenance Bond, in the amount of ten percent (10%) of the contract price, which shall be delivered by the CONTRACTOR to the CITY prior to acceptance of the WORK. The Maintenance Bond shall remain in force for one (1) year from the date of acceptance of the contracted WORK. The CONTRACTOR shall make all repairs and replacements within the time required during the guarantee period upon receipt of written order from the ENGINEER. If the CONTRACTOR fails to make the repairs and replacements within the required time, the CITY may do the work and the CONTRACTOR and the CONTRACTOR's surety for the Maintenance Bond shall be liable to the CITY for the cost. The expiration of the Maintenance Bond during the one-year guarantee period does not operate to waive or void the one-year guarantee, as set forth herein and in paragraph 6.16 of these General Conditions.

- C. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of “Companies Holding Certificates of Authority as Acceptable Sureties on Federal bonds and as Acceptable Reinsuring Companies” as published in Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operations, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of such agent’s authority to act.
- D. If the surety on any Bond furnished by the CONTRACTOR is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the WORK is located, the CONTRACTOR shall within 7 days thereafter substitute another Bond and surety, which must be acceptable to the CITY.
- E. All Bonds required by the Contract Documents to be purchased and maintained by CONTRACTOR shall be obtained from surety companies that are duly licensed or authorized in the State of California to issue Bonds for the limits so required. Such surety companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary General Conditions.

## 5.2 INSURANCE

Contractor and any subcontractor shall not commence work under this Agreement until Contractor shall have obtained all insurance required under this paragraph and such insurance shall have been approved by the City Attorney as to form and carrier and the City Manager as to sufficiency, nor shall Contractor allow any contractor or subcontractor to commence work on this contract or subcontract until all similar insurance required of the contractor and/or subcontractor shall have been so obtained and approved. All requirements herein provided shall appear either in the body of the insurance policies or as endorsements and shall specifically bind the insurance carrier.

CONTRACTOR shall procure and maintain for the duration of the contract all necessary insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the Contractor, the Contractor’s agents, representatives, employees or subcontractors.



**A. Minimum Scope of Insurance**

Coverage shall be at least as broad as:

1. Insurance Services Office Commercial General Liability coverage.
2. Insurance Services Office form number CA covering Automobile Liability, code 1 (any auto).
3. Workers' Compensation insurance as required by the State of California and Employer's Liability Insurance.
4. [Optional] Such other insurance coverages and limits as may be required by the CITY as follows: \_\_\_\_\_.

**B. Minimum Limits of Insurance**

CONTRACTOR shall maintain limits no less than:

1. General Liability: \$2,000,000 per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate liability is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.
2. Automobile Liability: \$1,000,000 per accident for bodily injury and property damage.
3. Employer's Liability: Bodily Injury by Accident - \$1,000,000 each accident  
Bodily Injury by Disease - \$1,000,000 policy limit  
Bodily Injury by Disease - \$1,000,000 each employee

**C. Deductibles and Self-Insured Retentions**

Any deductibles or self-insured retentions must be declared to and approved by the CITY. At the option of the CITY, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the CITY, its officers, officials, employees, and volunteers; or the CONTRACTOR shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses.

**D. Other Insurance Provisions**

The required general liability and automobile policies are to contain, or be endorsed to contain the following provisions:

1. The CITY, its officers, officials, employees, agents and volunteers are to be covered as insureds as respects: liability arising out of activities performed by or on behalf of the CONTRACTOR; products and completed operations of the CONTRACTOR; premises owned, occupied or used by the CONTRACTOR; or automobiles owned, leased, hired or borrowed by the CONTRACTOR. The coverage shall contain no special limitations on the scope of protection afforded to the CITY, its officers, officials, employees, agents or volunteers.
2. For any claims related to this project, the CONTRACTOR's insurance coverage shall be primary insurance as respects the CITY, its officers, officials, employees, agents and volunteers. Any insurance or self-insurance maintained by the CITY, its officers, officials, employees, agents or volunteers shall be excess of the CONTRACTOR's insurance and shall not contribute with it.
3. Any failure to comply with reporting or other provisions of the policies including breaches of warranties shall not affect coverage provided to the CITY, its officers, officials, employees, agents or volunteers.
4. The CONTRACTOR's insurance shall apply separately to each insured against whom claim is made or suit is brought except, with respect to the limits of the insurer's liability.
5. Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days' prior written notice by certified mail, return receipt requested, has been given to the CITY.

**E. Acceptability of Insurers**

Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A:VII.

**F. Verification of Coverage**

CONTRACTOR shall furnish the CITY with original endorsements effecting coverage required by this clause. The endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. The endorsements are to be on forms provided by the CITY. All endorsements are to be received and

approved by the CITY before work commences. As an alternative to the CITY's forms, the CONTRACTOR's insurer may provide complete, certified copies of all required insurance policies, including endorsements effecting the coverage required by these specifications.

## **ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES**

### **6.1 COMMUNICATIONS**

- A. Written communications with the CITY shall be only through or as directed by the ENGINEER.

### **6.2 SUPERVISION AND SUPERINTENDENCE**

- A. The CONTRACTOR shall supervise, inspect, and direct the WORK competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the WORK in accordance with the Contract Documents. The CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction and all safety precautions and programs incidental thereto. The CONTRACTOR shall be responsible to see that the completed WORK complies accurately with the Contract Documents.
- B. The CONTRACTOR shall designate in writing and keep on the Site at all times during the performance of the WORK a technically qualified, English-speaking superintendent, who is an employee of the CONTRACTOR and who shall not be replaced without written notice to the ENGINEER. The superintendent will be the CONTRACTOR's representative at the Site and shall have authority to act on behalf of the CONTRACTOR. All communications given to the superintendent shall be as binding as if given to the CONTRACTOR.
- C. The CONTRACTOR's superintendent shall be present at the Site at all times while work is in progress and shall be available by phone for emergencies 24 hours per day, 7 days per week. Failure to observe this requirement shall be considered suspension of the WORK by the CONTRACTOR until such time as such superintendent is again present at the Site.

### **6.3 LABOR, MATERIALS, AND EQUIPMENT**

- A. The CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out the WORK and perform construction as required by the Contract Documents. The CONTRACTOR shall furnish, erect, maintain, and remove the construction plant and any required temporary works. The CONTRACTOR shall at all times maintain good discipline and order at the Site. Except in connection with the safety or protection of persons or the WORK or property at the Site or adjacent thereto, and except as otherwise indicated in the

Contract Documents, all work at the Site shall be performed during regular working hours, and the CONTRACTOR will not permit overtime work or the performance of work on Saturday, Sunday, or any federally observed holiday without the CITY's written consent. The CONTRACTOR shall apply for this consent through the ENGINEER in writing a minimum of 24 hours in advance.

- B. Except as otherwise provided in this Paragraph, the CONTRACTOR shall receive no additional compensation for overtime work, i.e., work in excess of 8 hours in any one calendar day or hours in any one calendar week, even though such overtime work may be required under emergency conditions and may be ordered by the ENGINEER in writing. Additional compensation will be paid to the CONTRACTOR for overtime work only in the event extra work is ordered by the ENGINEER and the Change Order specifically authorizes the use of overtime work and then only to such extent as overtime wages are regularly being paid by the CONTRACTOR for overtime work of a similar nature in the same locality.
- C. All increased costs of inspection and testing performed during overtime work by the CONTRACTOR which is allowed solely for the convenience of the CONTRACTOR shall be borne by the CONTRACTOR. The CITY has the authority to deduct the cost of all such inspection and testing from any partial payments otherwise due to the CONTRACTOR.
- D. Unless otherwise specified in the Contract Documents, the CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, lubricants, power, light, heat, telephone, water, sanitary facilities, and all other facilities, consumables, and incidentals necessary for the furnishing, performance, testing, start-up, and completion of the WORK.
- E. All materials and equipment incorporated into the WORK shall be of specified quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of the CITY. If required by the ENGINEER, the CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents; but no provisions of any such instructions will be effective to assign to the CITY or any of its consultants, agents, or employees, any duty or authority to supervise or direct the furnishing or performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.9 C.
- F. The work, unless otherwise permitted or approved by the ENGINEER, shall be completed with the incorporated use of equipment, materials, and/or products where such are specified. Substitutions and equal alternatives will be permitted as

provided in this article; however, neither the request for substitution nor the offer of alternatives shall in any way by their submittal obligate the CITY to assent to any request or offer. Failure of the CONTRACTOR awarded the work to either submit requests for substitutions or to offer alternatives within the required times provided in this General Condition will be considered as evidence that the work shall be accomplished with trade-named equipment, materials, and/or products as identified in the Specifications and/or the Drawings.

- G. Unless otherwise provided elsewhere in the Contract, all equipment, materials, and/or products incorporated into the work shall be new and, where not specified, shall be of the highest quality of the respective kinds for the intended use, and all workmanship shall meet or exceed applicable construction industry standards and practices. If equipment, materials, and/or products are designated by listing named manufacturers of particular equipment, materials, and/or products followed by the words "or equal," then the CONTRACTOR may furnish the named equipment, materials, and/or products or any equal equipment, materials, and/or products. The first-named manufacturer of particular equipment, materials, and/or products is the basis for the design shown on the Project Drawings. A subsequently named manufacturer or particular equipment, materials, and/or products has been determined to be an acceptable substitution but may require modifications in the Project's design and its ultimate construction to accommodate its use. If such subsequently named items are selected by the CONTRACTOR for incorporation into the work, the CONTRACTOR shall assume all costs required for modifications to the equipment, materials, and/or products, and Project design and construction as may be required for said items' use. Substitutions for an unnamed "equal" item of material shall be permitted upon compliance of the procedures set forth in Paragraph I of this article. If a CONTRACTOR makes use of an unnamed "equal" product as a substitute for a specifically named material or product, the CONTRACTOR shall assume all costs required to make the necessary revisions or modifications to accommodate the use of said unnamed product.
- H. Before beginning the work and within thirty-five (35) calendar days after award of the Contract, the CONTRACTOR shall submit a List of Materials to the ENGINEER for review. The List shall include all items of equipment, materials, and/or products to be incorporated into the work and the names of suppliers with whom purchase orders have been placed. The names on the List shall be arranged in the same order as in the specifications, and shall contain sufficient data to identify precisely the items of equipment, materials, and/or products the CONTRACTOR proposes to furnish. The List shall include Specifications or Drawing references. Once the submission is determined to be acceptable to the ENGINEER, it shall be returned to the CONTRACTOR.
- I. Substitution for those equipment, materials, and/or products specified shall only be permitted when the proposed unnamed "equal" product or material to be furnished is both equal in quality and utility and after the CONTRACTOR has

complied with the following provisions: (1) All substitutions shall be reviewed by the ENGINEER. (2) The ENGINEER must approve such substitution in writing prior to its incorporation into the work. (3) Unless otherwise authorized in writing by the CITY, the CONTRACTOR shall, within thirty-five (35) calendar days of award and prior to placing any purchase orders, but at least thirty (30) calendar days before it requires approval of any such alternative item, submit to the CITY sufficient data, drawings, samples, literature, or other detailed information as will demonstrate to the ENGINEER that the proposed substitute is equal in quality and utility to the equipment, materials and/or products specified.

1. Within thirty (30) calendar days following receipt of all requested information from the CONTRACTOR, the ENGINEER will determine whether the proposed alternative is equal in quality and utility and meets the requirements of the Contract and will inform the CONTRACTOR in writing of such determination. The burden of substantiating the quality and utility of alternatives shall be upon the CONTRACTOR, and the CONTRACTOR shall furnish all necessary information requested and required by the ENGINEER. The ENGINEER will be the sole judge as to the quality and utility of alternative equipment, materials, and/or products, and the ENGINEER's decision shall be final. An acceptance by the ENGINEER of a substitution shall not relieve the CONTRACTOR from complying with the requirements of the Drawings and Specifications. Acceptance by the ENGINEER shall not relieve the CONTRACTOR from full responsibility for the efficiency, sufficiency, and quality and performance of the substitute equipment, materials, and/or products, in the same manner and degree as the equipment, materials, and/or products specified by name.
2. Failure of the CONTRACTOR to submit proposed substitutions for review in the manner described above and within the time prescribed shall be sufficient cause for rejection by the CITY of any other proposed substitutions.
3. In determining whether a proposed product is equal in quality and utility, the ENGINEER is not restricted to such basic issues as performance and durability, but may consider any other issues that the ENGINEER, in the discretion of the ENGINEER, deems appropriate. Said issues may, but are not required to include, nor are they limited to, such additional factors as comparable performance, reliability, efficiency of operation, ease of operation, adaptability, ease of maintenance, capital costs, life-cycle costs, operational characteristics, costs of training personnel, maintenance history, warranties, problems created by the resulting overall warranty system, availability of qualified service, availability of parts, the history of any supplier and compatibility with existing facilities.

4. No one factor or group of factors, including such issues as savings on capital costs, shall be determinative of whether the proposed product or material is equal in quality and utility. The decision of the ENGINEER shall be based on those factors deemed by the ENGINEER to be relevant and any data, drawings, samples, literature, or other detailed information furnished by the CONTRACTOR with respect to the proposed substitution. Each decision as to whether a product or material is equal in quality and utility shall be made by the ENGINEER on a case-by-case basis.
  5. The CONTRACTOR shall be responsible for any and all costs, including consultant costs, incurred by the CITY with respect to the proposed substitution that exceed the costs inherent in the normal and reasonable review of drawings and other standard data, information, and documents concerning any proposed substitution. The CONTRACTOR shall be responsible for this cost, regardless of whether or not the substitution is approved by the ENGINEER.
- J. Unless otherwise provided in the Contract, the title and interest in the right to the use of all water, and the title to all soil, stone, gravel, sand, minerals, timber, and all other materials developed or obtained within the Project limits from operations by the CONTRACTOR or any of its subcontractors, of any of their representatives or employees, and the right to use or dispose of the same are hereby expressly reserved in the CITY; and neither the CONTRACTOR nor any of its subcontractors, nor any of their representatives or employees, shall have any right, title, or interest in or to any part thereof.
- K. All material used under the Contract after it has been attached or affixed to the work or soil and after partial payment has been made therefore shall become the property of the CITY.
- L. In the event that any Indian relics or items possessing archaeological or historical value are discovered by the CONTRACTOR or any of its subcontractors or any of their representatives or employees, the CONTRACTOR shall immediately notify the ENGINEER and await the ENGINEER's decision before proceeding with any work. The CONTRACTOR shall have no property right in such relics and items.
- M. The CONTRACTOR shall be satisfied as to the quantity of acceptable materials or products which may be produced or obtained at local sources, and the CITY will not assume any responsibility as to the quantities or quality of acceptable materials or products available.
- N. The CONTRACTOR, with the permission of the ENGINEER, may use in the proposed construction such stone, gravel, sand, or other material suitable in the opinion of the ENGINEER as may be found in excavation.

- O. Existing equipment, materials, and/or products to be salvaged shall remain the property of the CITY. Salvage to be reinstalled in the work shall be refurbished as required before reinstallation. Other work to be salvaged shall be carefully removed and handled in such a manner as to avoid damage and shall be delivered to storage at a location designated by the ENGINEER.

#### 6.4 SCHEDULE

- A. The CONTRACTOR shall comply with the schedule requirements in the Special Provisions or as otherwise provided in the Contract Documents.

#### 6.5 SUBSTITUTES OR “OR EQUAL” ITEMS

- A. The CONTRACTOR shall submit proposed substitutes or “or equal” items in accordance with the Bidding Requirements. No request for substitution of an “or equal” item will be considered by the ENGINEER after award of the Contract, except as provided in Paragraph 6.3I herein.

#### 6.6 CONCERNING SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- A. The CONTRACTOR shall be responsible to the CITY for the acts and omissions of its Subcontractors, Suppliers, and their employees to the same extent as CONTRACTOR is responsible for the acts and omissions of its own employees. Nothing contained in this Paragraph shall create any contractual relationship between any Subcontractor and the CITY nor relieve the CONTRACTOR of any liability or obligation under the Contract Documents. The CONTRACTOR shall include these General Conditions and the Supplementary General Conditions as part of all its subcontract and supply agreements.

#### 6.7 PERMITS

- A. Unless otherwise provided in any Supplementary General Conditions, the CONTRACTOR shall obtain and pay for all construction permits and licenses from the agencies having jurisdiction, including the furnishing of insurance and bonds if required by such agencies. The enforcement of such requirements shall not be made the basis for claims for additional compensation by CONTRACTOR. When necessary, the CITY will assist the CONTRACTOR, in obtaining such permits and licenses. The CONTRACTOR shall pay all charges of utility owners for inspection or connections to the WORK.

#### 6.8 PATENT FEES AND ROYALTIES

- A. The CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the WORK or the incorporation in the WORK of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design,



process, product, or device is specified in the Contract Documents for use in the performance of the WORK and if to the actual knowledge of the ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed by the ENGINEER in the Contract Documents. The CONTRACTOR's indemnification obligation under this Paragraph 6.8 A. for all claims and liabilities arising out of any infringement of patent rights or copyrights incident to the use in the performance of the WORK or resulting from the incorporation in the WORK of any invention, design, process, product or device not specified in the Contract Documents shall be in accordance with Paragraph 6.16 of these General Conditions.

## 6.9 LAWS AND REGULATIONS

- A. The CONTRACTOR shall observe and comply with all Laws and Regulations which in any manner affect those engaged or employed on the WORK, the materials used in the WORK, or the conduct of the WORK including, but not limited to, all applicable safety Laws and Regulations. If any discrepancy or inconsistency should be discovered between the Contract Documents and any such Laws or Regulations, the CONTRACTOR shall report the same in writing to the ENGINEER. Any particular Law or Regulation specified or referred to elsewhere in the Contract Documents shall not in any way limit the obligation of the CONTRACTOR to comply with all other provisions of federal, state, and local laws and regulations. The CONTRACTOR's indemnification obligations for all claims or liability arising from violation of any such law, ordinance, code, order, or regulation, whether by CONTRACTOR or by its employees, Subcontractors or Suppliers shall be in accordance with Paragraph 6.16 of these General Conditions.

## 6.10 TAXES

- A. The CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by the CONTRACTOR in accordance with the laws and regulations of the place of the Project which are applicable during the performance of the WORK.

## 6.11 USE OF PREMISES

- A. The CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site, the land and areas identified in and permitted by the Contract Documents, and the other land and areas permitted by Laws and Regulations, rights-of-way, permits, and easements. The CONTRACTOR shall assume full liability and responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any land or areas contiguous thereto, resulting from the performance of the WORK. Should any claim be made against the CITY by any such owner or occupant because of the performance of the WORK, the CONTRACTOR shall

promptly attempt to settle with such other party by agreement or otherwise resolve the claim through litigation at the CONTRACTOR's sole liability expense. The CONTRACTOR's indemnification obligations for all claims and liability, arising directly, indirectly, or consequentially out of any action, legal or equitable, brought by any such owner or occupant against the CITY, its consultants, subconsultants, and the officers, directors, employees and agents of each and any of them to the extent caused by or based upon the CONTRACTOR's performance of the WORK shall be in accordance with Paragraph 6.16 of these General Conditions.

## 6.12 SAFETY AND PROTECTION

- A. The CONTRACTOR shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the WORK. The CONTRACTOR shall be responsible for the direction and control of the work assigned and for assuring that all workers on the project understand the hazards of the work involved and the safe work procedures required for each job. The CONTRACTOR shall assure that its subcontractors of all tiers shall, without expense to the CITY, comply with this safety responsibility. No work shall proceed until each worker and subcontractor understands the scope of the work and all safety rules and work procedures to be followed. The CONTRACTOR shall not allow a new employee or new subcontractor to begin work on CITY projects without a full and proper safety orientation. The CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage to prevent damage, injury or loss to:
1. All persons at the Site and other persons and organizations who may be affected thereby;
  2. All the WORK and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
  3. Other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of the performance of the WORK.
- B. The CONTRACTOR shall comply with all applicable Laws and Regulations relating to the safety of persons or property or to the protection of persons or property from damage, injury, or loss and shall erect and maintain all necessary safeguards for such safety and protection. The CONTRACTOR shall notify owners of adjacent property and utilities when prosecution of the WORK may effect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. CONTRACTOR'S duties and responsibilities for safety and for protection of the WORK shall continue until such time as all the

WORK is completed and ENGINEER has issued a notice to the CONTRACTOR in accordance with Paragraph 14.7 B. that the WORK is acceptable.

- C. The CONTRACTOR shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.
- D. Materials that contain hazardous substances or mixtures may be required on the WORK. A Material Safety Data Sheet shall be made available at the Site by the CONTRACTOR for every hazardous product used.
- E. Material usage shall strictly conform to OSHA safety requirements and all manufacturer's warnings and application instructions listed on the Material Safety Data Sheet and on the product container label.
- F. The CONTRACTOR shall be responsible for the exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.
- G. The CONTRACTOR shall notify the ENGINEER if it considers a specified product or its intended use to be unsafe. This notification must be given to the ENGINEER prior to the product being ordered, or if provided by some other party, prior to the product being incorporated in the WORK.
- H. Before starting work, the CONTRACTOR shall submit a written safety program to the CITY. The objective of the safety program shall be accident prevention. Such program shall include, but not be limited to, the following:
  - 1. An organization chart and accompanying narrative which describes the responsibility for employee and public safety of those individuals who control each phase of operations and set forth in writing the policies and procedures to be followed by all personnel. The chart shall also show the CONTRACTOR's internal lines of communication (including subcontractors) for the program.
  - 2. A specific program for communication between the CONTRACTOR and CITY on safety matters. The CONTRACTOR shall also designate one person with whom official contact can be made by the CITY on safety matters.
  - 3. Evidence that the CONTRACTOR has become thoroughly familiar with the potential hazards of the work and applicable federal and state regulations.

4. Specific safety procedures and guidelines for conduct of the Work.
5. The CITY's review, comment upon, and/or acceptance of the CONTRACTOR's safety program and/or plan does not in any way negate the responsibilities of the CONTRACTOR for safety or place any responsibility upon the CITY for such safety. Such review comment and/or acceptance shall not be construed as limiting in any manner the CONTRACTOR's obligation to undertake any action which may be necessary or required to establish and maintain safe working conditions at the site.

#### 6.13 EMERGENCIES

- A. In emergencies affecting the safety or protection of persons or the WORK or property at the Site or adjacent thereto, CONTRACTOR, without special instruction or authorization from ENGINEER, is obligated to immediately act to prevent threatened damage, injury, or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the WORK or variations from the Contract Documents have been caused thereby. If ENGINEER determines that a change in the Contract Documents have been caused thereby. If ENGINEER determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to such an emergency, a Change Order will be issued to document the consequences of such action.

#### 6.14 SUBMITTALS

- A. After checking and verifying all field measurements and after complying with applicable procedures specified in the Special Provisions, the CONTRACTOR shall submit to the ENGINEER for review all Shop Drawings and details of all structural and reinforcing steel, equipment, electrical controls, structural fabrications, pipe, pipe joints, special pipe sections, and other appurtenances in accordance with the accepted schedule of Shop Drawing submittals specified in the Special Provisions or as otherwise provided in the Contract Documents.
- B. The ENGINEER'S review will be only to determine if the items covered by the submittals will, after installation or incorporation in the WORK, generally conform to the Contract Documents and with the design concept of the completed Project. The ENGINEER's favorable review shall be obtained before any such items are manufactured or used in the work. The favorable review of Drawings by the ENGINEER shall apply in general design only and shall in no way relieve the CONTRACTOR from responsibility for errors or omissions contained therein. Favorable review by the ENGINEER shall not relieve the CONTRACTOR of its obligation to meet safety requirements and all other requirements of law. The ENGINEER will start reviewing the CONTRACTOR's submittals only after the

Notice to Proceed is issued by the CITY with the exception of some unusual long lead items which may require submittals prior to issuing the Notice to Proceed.

- C. The CONTRACTOR shall also submit to the ENGINEER for review all Samples in accordance with the accepted schedule of Sample submittals specified in the Special Provisions or as otherwise provided in the Contract Documents.
- D. Before submittal of each Shop Drawing or Sample, the CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar data with respect thereto and reviewed or coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the WORK and the Contract Documents. The CONTRACTOR shall provide submittals in accordance with the requirements of the Special Provisions or as otherwise provided in the Contract Documents.
- E. Shop-drawing submittal and coordination are the responsibility of the prime contractor; this responsibility shall not be delegated in whole or in part to subcontractors or suppliers. Any designation of work "by others," shown on Shop Drawings, shall mean that the work will be the responsibility of the CONTRACTOR rather than the subcontractor or supplier who has prepared the Shop Drawings.

Submittals shall be prepared in such form that data can be identified with the applicable Specification paragraph. The data shall demonstrate clearly compliance with the Drawings and Specifications and shall relate to the specific equipment to be furnished. Where manufacturer's standard drawings are employed, they shall be marked clearly to show what portions of the data are applicable to this Project.

- F. Review of shop-drawing submittals by the ENGINEER has as its primary objective the completion for the CITY of a Project in full conformance with the Drawings and Specifications, unmarred by field corrections, and within the time provided. In addition to this primary objective, shop-drawing review as a secondary objective will assist the CONTRACTOR in its procurement of equipment that will meet all requirements of the Drawings and Specifications, will fit the structures detailed on the Drawings, will be complete with respect to piping, electrical, and control connections, will have the proper functional characteristics, and will become an integral part of a complete operating facility. Acceptance of Shop Drawings and submittals does not constitute a change order to the Contract requirements.
- G. Where the CONTRACTOR is required by these Specifications to make submittals, they shall be submitted to the ENGINEER with a letter of transmittal and in sufficient number of copies to allow a distribution of at least one (1) copy to all parties needing a copy to carry out the provisions of the Specifications, including three (3) copies to be retained by the ENGINEER. The ENGINEER

shall determine the appropriate number of such copies required at the time of the preconstruction conference.

H. Within twenty-five (25) calendar days of receipt by the ENGINEER of each of the CONTRACTOR's submissions and all appurtenant data required for their review, the appropriate number of copies will be returned to the CONTRACTOR with one of the following notations:

1. Resubmittal not required; correction, if any, noted.
2. Correct and resubmit; corrections noted.

Returned copies of Drawings marked with Notation "1" authorize the CONTRACTOR to proceed with the operations covered by such returned copies, provided that such operations be subject to the comments, if any, shown on such returned copies. Returned copies of Drawings marked with Notation "2" shall be corrected, as necessary and required, and shall be submitted in the same manner as before.

I. When submittals are favorably reviewed, the ENGINEER will retain three (3) copies and will return all other copies to the CONTRACTOR. When submittals are not favorably reviewed, the ENGINEER will retain only two (2) copies and will return all others to the CONTRACTOR. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submission to the ENGINEER at least by the second submission of data. The CITY reserves the right to deduct monies from payments due the CONTRACTOR to cover additional costs of the ENGINEER's review beyond the second submission.

J. Favorable review by the ENGINEER will not constitute acceptance by the ENGINEER of any responsibility for the accuracy, coordination, and completeness of the Shop Drawings or the items of equipment represented on the Drawings. Accuracy, coordination, and completeness of Shop Drawings shall be the sole responsibility of the CONTRACTOR, including responsibility to back check comments, corrections, and modifications from the ENGINEER's review before fabrication. Supplemental, specific requirements for Shop Drawings and details are contained in the applicable technical sections of these Specifications.

K. Copies of schedules and Shop Drawings submitted to the ENGINEER for review shall be such as to provide three (3) copies for the ENGINEER's files, and such additional copies as the CONTRACTOR may desire for its own office files and/or for distribution by it to subcontractors or vendors. Exceptions will be noted in specific sections of Specifications. All Shop Drawings and supporting data, catalogs, and schedules shall be submitted as the instruments of the CONTRACTOR, who shall be responsible for their accuracy and completeness. These submittals may be prepared by the CONTRACTOR, subcontractors, or suppliers, but the CONTRACTOR shall ascertain that submittals meet all of the

requirements of the Contract, while conforming to structural, space, and access conditions at the point of installation. The CONTRACTOR shall check all submittals before submitting them to the ENGINEER.

- L. The ENGINEER shall check and review schedules, drawings, etc., submitted by the CONTRACTOR only for general design conformance with the concept of the Project and compliance with the Contract. Shop Drawings shall not be used to order products' fabrication or delivery for construction or installation unless submitted to and favorably reviewed by the ENGINEER. Acceptance by the ENGINEER of any drawings, method of work, or any information regarding materials and equipment the CONTRACTOR proposes to furnish shall not relieve the CONTRACTOR of its responsibility for any errors therein and shall not be regarded as an assumption of risks or liability by the Design ENGINEER or the CITY, or any officer or employee thereof, and the CONTRACTOR shall have no recourse against the CITY under the Contract on account of the failure or partial failure or inefficiency or insufficiency of any plan or method of work or material and equipment so accepted. Such acceptance shall be considered to mean merely that the ENGINEER has no objection to the CONTRACTOR using, upon its own full responsibility, the plan or method of work proposed or furnishing the materials and equipment proposed.

#### 6.15 CONTINUING THE WORK

- A. The CONTRACTOR shall carry on the WORK and adhere to the progress schedule during all disputes or disagreements with the CITY. No WORK shall be delayed or postponed pending resolution of any disputes or disagreements, except as the CONTRACTOR and the CITY may otherwise agree in writing.

#### 6.16 CONTRACTOR'S GENERAL WARRANTY AND GUARANTEE

- A. CONTRACTOR warrants and guarantees that all WORK will be in accordance with the Contract Documents and will not be defective. The CONTRACTOR represents that the WORK performed pursuant to the Contract shall be of the quality specified or of the highest quality if no quality is specified, and shall conform to the Contract Documents. The CONTRACTOR warrants all equipment, material, products, and workmanship furnished and all work performed under the Contract against defects for a period of one (1) year after final acceptance regardless of whether the same were furnished or performed by the CONTRACTOR or by any of its subcontractors or suppliers of any tier.
- B. The CONTRACTOR shall make, at its own expense, all repairs and/or replacements necessitated by defects in the equipment, materials, and/or products and in the workmanship provided by the CONTRACTOR or any of its subcontractors that become evident within the warranty period.

- C. Upon receipt of written notice from the CITY of any breach of warranty during the applicable warranty period, the affected item shall be redesigned, repaired, or replaced by the CONTRACTOR and the CONTRACTOR shall perform such tests as the CITY may require to verify that such redesign, repair, and replacement comply with the requirements of the Contract. The CITY shall have the right to operate and use such equipment, materials, and/or products until they can, without damage to the CITY, be taken out of service for correction or replacement by the CONTRACTOR. As to the redesigned, repaired, or replaced work, the CONTRACTOR warrants such redesigned, repaired, or replaced work against defective design, equipment, materials, products, and workmanship for a period of one (1) year from and after the date of satisfactory completion of such redesigned, repaired, or replaced work. The CITY reserves the right to require that the CONTRACTOR performs such repair or replacement work.
- D. The CITY also reserves the right to make such repairs or replacements, if, within seven (7) calendar days after the mailing of a notice in writing to the CONTRACTOR and Surety, the CONTRACTOR shall neglect to make or undertake with due diligence the aforesaid repairs or replacements and that Surety within seven (7) calendar days after mailing of a notice in writing of such negligence of the CONTRACTOR shall neglect to make or undertake with due diligence the aforesaid repairs or replacements itself, provided, however, that in the case of an emergency where in the opinion of the CITY delay would cause hazard to health or serious loss or damage, repair may be made without notice being sent to the CONTRACTOR or Surety, and the CONTRACTOR shall pay the cost thereof.
- E. All costs including workforce and materials incidental to such redesign, repair, replacement, and testing, including the removal, replacement, and reinstallation of equipment necessary to gain access and all other costs incurred as the result of a breach of warranty shall be borne by the CONTRACTOR whether performed by the CITY or the CONTRACTOR.
- F. Nothing in this section shall be construed to limit, relieve, or release the CONTRACTOR, subcontractor's, and equipment, materials, and/or products suppliers, and other service providers' liability to the CITY for damages sustained as the result of latent defects in the workmanship, equipment, materials, and/or products done and/or furnished by the CONTRACTOR, its subcontractors, suppliers and/or other service providers.
- G. The Performance Bond shall extend for a period of one (1) year after acceptance of the Contract by the CITY and shall cover the CONTRACTOR's obligations resulting from the warranty requirements herein specified.
- H. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:



1. Abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, or Suppliers, or other individual or entity for whom CONTRACTOR is responsible;
  2. Normal wear and tear under normal usage.
- I. CONTRACTOR's obligation to perform and complete the WORK in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of WORK that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents:
1. Observations by ENGINEER;
  2. Recommendation by ENGINEER or payment by CITY of any progress or final payment;
  3. The issuance of a Certificate of Completion by the CITY;
  4. Use or occupancy of the WORK or any part thereof by the CITY;
  5. Any acceptance by CITY or any failure to do so;
  6. Any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice or acceptability by ENGINEER pursuant to Paragraph 14.7 B.;
  7. Any inspection, test, or approval by others; or
  8. Any correction of Defective Work by CITY.

#### 6.17 INDEMNIFICATION

- A. Contractor shall indemnify, defend with counsel acceptable to City, and hold harmless to the full extent permitted by law, City and its officers, officials, employees, agents and volunteers from and against any and all liability, loss, damage, claims, expenses and costs (including, without limitation, attorney fees and costs and fees of litigation) (collectively, "Liability") of every nature arising out of or in connection with Contractor's performance of the WORK or its failure to comply with any of its obligations contained in this Agreement, except such Liability caused by the active negligence, sole negligence or willful misconduct of the City. Such indemnification by the CONTRACTOR shall include, but not be limited to, the following:
1. Liability or claims resulting directly or indirectly from the negligence or carelessness of the CONTRACTOR, its subcontractors, employees, or

agents in the performance of the WORK, or in guarding or maintaining the same, or from any improper materials, implements, or appliances used in its construction, or by or on account of any act or omission of the CONTRACTOR, its employees, or agents;

2. Liability or claims arising directly or indirectly from bodily injury, occupational sickness or disease, or death of the CONTRACTOR's, or Supplier's own employees, or agents engaged in the WORK resulting in actions brought by or on behalf of such employees against the CITY and/or the ENGINEER;
3. Liability or claims arising directly or indirectly from or based on the violation of any Laws or Regulations, whether by the CONTRACTOR, its subcontractors, employees, or agents;
4. Liability or claims arising directly or indirectly from the use or manufacture by the CONTRACTOR, its subcontractors, employees, or agents in the performance of this Agreement of any copyrighted or uncopyrighted composition, secret process, patented or unpatented invention, article, or appliance, unless otherwise specified stipulated in this Agreement;
5. Liability or claims arising directly or indirectly from the breach of any warranties, whether express or implied, made to the CITY or any other parties by the CONTRACTOR, its subcontractors, employees, or agents;
6. Liability or claims arising directly or indirectly from the willful misconduct of the CONTRACTOR, its subcontractors, employees, or agents;
7. Liability or claims arising directly or indirectly from any breach of the obligations assumed in this Agreement by the CONTRACTOR;
8. Liability or claims arising directly or indirectly from, relating to, or resulting from a hazardous condition created by the CONTRACTOR, Subcontractors, Suppliers, or any of their employees or agents, and;
9. Liability or claims arising directly, or indirectly, or consequentially out of any action, legal or equitable, brought against the CITY, the ENGINEER, their consultants, subconsultants, and the officers, directors, employees and agents of each or any of them, to the extent caused by the CONTRACTOR's use of any premises acquired by permits, rights of way, or easements, the Site, or any land or area contiguous thereto or its performance of the WORK thereon.

- B. The CONTRACTOR shall reimburse the CITY for all costs and expenses, (including but not limited to fees and charges of engineers, architects, attorneys, and other professionals and court costs of appeal) incurred by said CITY in enforcing the provisions of this Paragraph.
- C. The indemnification obligation under this Article 11 shall not be limited in any way by any limitation on the amount or type of insurance carried by CONTRACTOR or by the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR or any Subcontractor or other person or organization under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- D. Pursuant to California Public Contract Code Section 9201, City shall timely notify Contractor of receipt of any third-party claim relating to this Agreement.

#### 6.18 CONTRACTOR'S DAILY REPORTS

- A. The CONTRACTOR shall complete a daily report indicating location worked, total manpower for each construction trade, major equipment on Site, each Subcontractor's manpower and equipment, weather conditions, and other related information involved in the performance of the WORK. These components will be decided by the ENGINEER.

#### 6.19 CONTRACT DOCUMENTS AND RECORD DRAWINGS

- A. The CONTRACTOR shall keep on the work site a copy of the Contract Documents and shall at all times give the ENGINEER access thereto. Any drawings included in the Specifications shall be regarded as part thereto and of the Contract. Anything mentioned in these Specifications and not shown on the Project Drawings, or shown on the Project Drawings and not mentioned in these Specifications, shall be of like effect as though shown or mentioned in both. The ENGINEER will furnish from time to time such detail drawings, plans, profiles, and information as he may consider necessary for the CONTRACTOR's guidance. It shall be the duty of the CONTRACTOR to see that the provisions of the Contract Documents are complied with in detail irrespective of the inspection given the work during its progress by the ENGINEER. Any failure on the part of the CONTRACTOR to observe the requirements contained in the Contract Documents will be sufficient cause for the rejection of the work at any time before its acceptance.
- B. The CONTRACTOR shall maintain, at the jobsite, one record set of Drawings in good order and clearly marked to show any deviations which have been made from the Drawings, including concealed construction and utility features which are revealed during the course of construction. Marked prints shall be updated at least once each week and shall be available to the ENGINEER for review as to

currency prior to developing partial payment estimates. Upon completion of the work, the marked set of prints shall be delivered to the ENGINEER.

- C. In the case of those drawings which depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, the Record Drawings shall be updated by indicating those portions which are superseded by change order drawings or final shop drawings, and by including appropriate reference information describing the change orders by number and the shop drawings by manufacturer, drawing, and revision numbers.
- D. Requests for partial payments will not be approved if the updated set of Drawings is not in good order or is not kept current. Request for final payment will not be approved until the complete and correct Record Drawings are delivered to the ENGINEER.

## 6.20 CLEAN UP

The CONTRACTOR shall, at all times, keep the premises, occupied by it in relation to this Contract, in a neat, clean, and safe condition and at all times provide reasonable access thereto. The CONTRACTOR shall, as a minimum, conduct daily inspections to verify that requirements of this Article are being met.

- A. During the progress of the WORK, the CONTRACTOR shall:
  - 1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of material.
  - 2. Provide adequate storage of all items awaiting removal from the jobsite, observing all requirements for fire protection and protection of the environment.
  - 3. Remove any accumulation of scrap, debris, waste material, and other items not required for construction of this work.
  - 4. Dispose of existing materials and equipment to be demolished and removed and all trash such as broken concrete, wood blocking, shipping containers, etc., resulting from the contract work off the premises occupied by the CONTRACTOR, including CITY property, at the CONTRACTOR's expense. CITY-leased dumpsters and other disposal containers on CITY's property, unless specifically provided by the CONTRACTOR, shall not be used by the CONTRACTOR.
  - 5. Maintain all excavation, embankments, haul roads, permanent access roads, Plant site, waste disposal areas, borrow areas, and all other work areas within contract work limits free from dust, as determined by the

ENGINEER. Industry-accepted methods of dust control suitable for the area involved, such as sprinkling, chemical treatment, light bituminous treatment, or similar methods, will be permitted. No separate payment will be made to the CONTRACTOR for dust control.

- B. If the CONTRACTOR fails to comply with any of the foregoing, the CITY will transmit written notification of noncompliance. If, within five (5) calendar days of the written notification, the CONTRACTOR fails to comply, cleanup may be undertaken by the CITY at the expense of the CONTRACTOR.
- C. Upon completion of any portion of any WORK, the CONTRACTOR shall promptly remove all of its equipment, temporary structures, and surplus construction and other materials not to be used at or near the same location during later stages of work. Upon completion of any WORK and before final inspection is made, the CONTRACTOR shall unless otherwise specifically directed by the ENGINEER:
  - 1. Remove from the job site all plant, buildings, tools, surplus materials, equipment, forms, rubbish, scrap, debris, and waste.
  - 2. Clean all paved areas on the site. Completely remove all resultant debris.
  - 3. Visually inspect all interior surfaces, and remove all traces of soil, waste material, smudges, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. Remove all paint droppings, spots, stains, and dirt from finished surfaces. Use only approved cleaning materials and equipment.
  - 4. Restore any improved area used for the CONTRACTOR's work or material storage to its condition at the time the CONTRACTOR moved onto the site or to the satisfaction of the ENGINEER.
  - 5. Schedule final cleaning and improvement restoration to enable the CITY to accept a completely clean and restored project.

## 6.21 STORM WATER POLLUTION PREVENTION

### A. General

- 1. Prevention - The CONTRACTOR shall prevent the pollution of storm drain systems and creeks on or near the construction project site(s) resulting from the construction operation. The CONTRACTOR shall keep pollution out of storm drains by reducing the possibility of accidental discharge of materials and wastes, by reducing erosion and sedimentation, and by any action as required. The CONTRACTOR shall train all employees and subcontractors on the storm water pollution prevention

requirements contained in these Specifications and ensure that all employees and subcontractors are aware of the consequences as described in subsection A.3. below. The CONTRACTOR shall include appropriate subcontract provisions to ensure that these requirements are met by all subcontractors.

2. Notification - If the CONTRACTOR causes or permits the spillage or overflow of any sewage, oil, or petroleum product, hazardous substance, contaminant, or waste that may result in the fluid or substance being discharged directly or indirectly into any storm drains, creeks, wetlands, or other manmade or natural waterways the CONTRACTOR shall notify the CITY as soon as possible to the extent notification can be provided without substantially impeding cleanup or other emergency measures. In no event shall such notification be later than one hour after knowledge of the occurrence.
3. Cleanup - Immediately upon gaining knowledge of such spillage, overflow, or discharge, the CONTRACTOR shall eliminate the cause of the spillage, overflow, or discharge and take action to minimize any damages. The CONTRACTOR shall also immediately implement a cleanup program. The cleanup, including sampling and testing required by regulatory agencies to determine the nature and level of contamination shall be performed and completed to the satisfaction of the various regulatory agencies involved and the CITY, at the expense of the CONTRACTOR. Any fines, penalties, and/or subsequent actions imposed upon the CITY and/or the CONTRACTOR by regulatory agencies related to the spillage, overflow, or discharge and any subsequent monitoring, testing, and reporting, as required by regulatory agencies, shall also be at the expense of the CONTRACTOR. The CONTRACTOR shall keep a stockpile of spill cleanup materials, such as rags or absorbents, readily accessible on site. The quantity of cleanup materials shall be appropriate in consideration of the risk of an occurrence of a spill, overflow or discharge.

B. Management of Nonhazardous Material and/or Waste

1. Designated Area - The CONTRACTOR shall propose designated areas of the project site, for approval by the ENGINEER, suitable for material delivery, storage, and waste collection that to the maximum extent practicable are near construction entrances and away from catch basins, gutters, drainage courses, and creeks.
2. Backfill or Excavated Material - The CONTRACTOR shall not allow backfill or excavated material to enter the storm drains or creeks. When rain is forecast within 24 hours or during wet weather, the

CONTRACTOR may be required to cover such material with a tarpaulin and to surround the material with sand bags.

3. Street Sweeping - At least once per week or more frequently as directed by the ENGINEER, the CONTRACTOR shall clean and sweep roadways and on-site paved areas of all materials attributed to or involved in the work. The CONTRACTOR shall not use water to flush down streets in place of street sweeping.
4. Disposal - At the end of each working day, the CONTRACTOR shall collect all scrap, debris, and waste material, and dispose of such materials properly. The materials may be stored in the CONTRACTOR's yard in stockpiles or placed in dumpsters. The CONTRACTOR shall inspect dumpsters for leaks and replace or repair dumpsters that leak. The CONTRACTOR shall not discharge water from cleaning dumpsters on site. The CONTRACTOR shall arrange for regular waste collection before dumpsters overflow.

C. Management of Hazardous Material and/or Waste

1. Storage - The CONTRACTOR shall label and store all hazardous materials, such as pesticides, paints, thinners, solvents, and fuels, and all hazardous wastes, such as waste oil and antifreeze in accordance with all applicable state and federal regulations. The CONTRACTOR shall store all hazardous materials and all hazardous wastes in accordance with secondary containment regulations. All such materials and wastes shall be covered, as needed, to avoid rainwater becoming polluted with hazardous constituents which could result in potential management of collected rain water as a hazardous waste. The CONTRACTOR shall keep an accurate, up-to-date inventory, including Material Safety Data Sheets (MSDSs), of hazardous materials and hazardous wastes stored on site.
2. Usage - When rain is forecast within 24 hours or during wet weather, the CONTRACTOR shall refrain from applying chemicals in outside areas. The CONTRACTOR shall follow material manufacturer's instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals. The CONTRACTOR shall post warning signs in areas treated with chemicals.
3. Disposal - The CONTRACTOR shall arrange for regular hazardous waste collection to comply with time limits on storage of hazardous wastes. The CONTRACTOR shall dispose of hazardous waste in accordance with all applicable local, state and federal regulations. The CONTRACTOR shall not wash any spilled material into streets, gutters, storm drains, or creeks and shall not bury spilled hazardous materials. The CONTRACTOR shall

report any hazardous materials spill to the CITY in accordance with Section A.2 above.

D. Vehicle/Equipment Cleaning, Maintenance, and Fueling

1. General - The CONTRACTOR shall inspect vehicles and equipment arriving on site for leaking fluids and shall promptly repair leaking vehicles and equipment. Drip pans shall be used to catch leaks until repairs are made.

The CONTRACTOR shall comply with federal, state, and city requirements for aboveground storage tanks.

2. Cleaning - The CONTRACTOR shall perform vehicle or equipment cleaning with water only in a designated, bermed area that will not allow rinse water to run off site into streets, gutters, storm drains, or creeks. Soaps, solvents, degreasers, steam-cleaning equipment, or equivalent methods shall not be allowed.
3. Maintenance and Fueling - The CONTRACTOR shall perform maintenance and fueling of vehicles or equipment in areas that will not allow run-on of storm water or runoff of spills to storm drains and provide for confined clean-up. Examples are working in bermed areas or utilizing drip pans. The CONTRACTOR shall not contaminate the soils or groundwater with such maintenance and fueling activities.

The CONTRACTOR shall use secondary containment, such as a drip pan, to catch leaks or spills any time that vehicle or equipment fluids are dispensed, changed, or poured, and shall clean up leaks and spills of vehicle or equipment fluids immediately and dispose of the waste and cleanup materials as hazardous waste, as described in Section C.3 above.

E. Dewatering Operations

1. Sediment Control - The CONTRACTOR shall route water through a control measure, such as a sediment trap, sediment basin, or Baker tank, to remove settleable solids prior to discharge to the storm drain system. Straw bales shall be placed in front of storm drain inlets as required. Filtration of the water following the control measure may be required on a case-by-case basis. Approval of the control measure shall be obtained in advance from the ENGINEER. If the ENGINEER determines that the dewatering operation would not generate an appreciable amount of settleable solids, the control measure requirement above may be waived.
2. Contaminated Groundwater - If the project is within an area of known groundwater contamination or if contamination is found, water from



dewatering operations shall be tested prior to discharge. If the water quality meets Regional Water Quality Control Board (RWQCB) standards, it may be discharged to a storm drain or creek. Otherwise, the water shall be hauled off site for proper disposal.

F. Paving or Oiling Operations

1. When rain is forecast within 24 hours or during wet weather, the ENGINEER may prevent the CONTRACTOR from paving or oiling the street. The ENGINEER may direct the CONTRACTOR to protect drainage courses by using control measures, such as earth dike, straw bale, and sand bag, to divert runoff or trap and filter sediment.
2. The CONTRACTOR shall prevent saw-cut slurry from entering catch basins and storm drains by limiting the area over which the slurry may spread.
3. The CONTRACTOR shall cover catch basins and manholes when paving or applying seal coat, tack coat, slurry seal, or fog seal.
4. The CONTRACTOR shall not sweep or wash down excess sand (placed as part of a sand seal or to absorb excess oil) into gutters, storm drains, or creeks. The CONTRACTOR shall either collect the sand and return it to the stockpile or dispose of it in a trash container.

G. Concrete, Grout, and Mortar Waste Management

1. Concrete Truck/Equipment Washout - The CONTRACTOR shall not wash out concrete trucks or equipment into streets, gutters, storm drains, or creeks. The CONTRACTOR shall perform washout of concrete trucks or equipment off site or in a designated area on site where the water will flow onto dirt or into a temporary pit in a dirt area. The CONTRACTOR shall let the water percolate into the soil and dispose of the hardened concrete in a trash container. If a suitable dirt area is not available, the CONTRACTOR shall collect the wash water and remove it off site.
2. Exposed Aggregate Concrete Wash Water - The CONTRACTOR shall avoid creating runoff by draining water from washing of exposed aggregate concrete to a dirt area. If a suitable dirt area is not available, the CONTRACTOR shall filter the wash water through straw bales or equivalent material before discharging to a storm drain. The CONTRACTOR shall collect sweepings from exposed aggregate concrete for disposal.

H. Paint Disposal and Clean-up

1. Disposal of Unused Paint - The CONTRACTOR shall carefully use, store and dispose of paint, solvents, chemicals, and waste materials in compliance with all applicable state and federal regulations. The CONTRACTOR shall not dispose of paint to sanitary sewer systems or storm drains. The CONTRACTOR shall utilize other recycling and disposal services as follows:

- a. "Recycling Centers" and "Waste Disposals" as may be listed in the yellow pages.
- b. Local household hazardous waste facility if appropriate.

The CONTRACTOR may dispose of small amounts of leftover latex (water-based) paint by applying the paint to the surface of an item to be discarded and allowing it to dry thoroughly, then disposing of it in a dumpster.

The CONTRACTOR shall store these materials and conduct cleaning of painting equipment and tools in a designated area that will not allow run-on of storm water or runoff of spills. The CONTRACTOR shall not allow wash water from cleaning of painting equipment and tools into streets, gutters, storm drains, or creeks.

2. Disposal of Paint Clean-up Waste - The CONTRACTOR shall remove as much excess paint as possible from brushes, rollers, and equipment before starting cleanup.

- a. The CONTRACTOR shall not discharge cleaning wastes from oil-based paints, buckets, brushes or tools to the sanitary sewer system. The CONTRACTOR shall retain a certified waste hauler to recycle or to dispose of cleaning wastes from oil-based paints at the CONTRACTOR's expense.
- b. The CONTRACTOR may discharge very small amounts of cleaning wastes from brushes, rollers, buckets, and tools contaminated with latex (water-based) paints to the sanitary sewer system provided they do not contain additives with pollutants of concern (e.g., mercury, tributyltin). Brushes, rollers, and tools containing latex paints may be washed over a sink with plenty of water. Buckets containing latex paints shall first be emptied into the original can or discarded as specified in paragraph 1 above. Should excessive amounts of paint or solvent be found in the wastewater discharged, the CONTRACTOR may be subject to

enforcement action by the CITY in accordance with the City Codes.

- c. The CONTRACTOR shall not discharge any of these paint clean-up wastes to storm drains, streets, gutters, or creeks.
  - d. Waste Disposal - The CONTRACTOR shall dispose of waste thinner, solvent, and sludge from cleaning of equipment and tools as hazardous waste, as described in Section C.3 above. The CONTRACTOR shall dispose of excess thinners, solvents, and oil- and water-based paint as hazardous waste.
- I. Contaminated Soil - If the project is within an area of known soil contamination or evidence of soil contamination is found, the CONTRACTOR shall comply with the requirements of all applicable local, state and federal regulations.

## **ARTICLE 7 – OTHER WORK**

### **7.1 RELATED WORK AT SITE**

- A. The CITY may perform other work related to the Project at the Site by the CITY's own forces, have other work performed by utility owners, or let other direct contracts for such other work. If the fact that such other work is to be performed was not noted in the Contract Documents, written notice thereof will be given to the CONTRACTOR prior to starting any such other work.
- B. The CONTRACTOR shall afford each person who is performing the other work (including the CITY's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the WORK with theirs. The CONTRACTOR shall do all cutting, fitting, and patching of the WORK that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. The CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will not only cut or alter their work with the written consent of the ENGINEER and the others whose work will be affected.
- C. If the proper execution or results of any part of the CONTRACTOR's work depends upon such other work by another, the CONTRACTOR shall inspect and report to the ENGINEER in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for such proper execution and results. The CONTRACTOR's failure to report such delays, defects, or deficiencies will constitute an acceptance of the other work as fit and proper for integration with the CONTRACTOR's work except for latent or nonapparent defects and deficiencies in the other work.

## 7.2 COORDINATION

- A. If the CITY contracts with others for the performance of other work at the Site, CITY will have sole authority and responsibility in respect of such coordination, unless otherwise provided in the Supplementary General Conditions.

## ARTICLE 8 – CITY’S RESPONSIBILITIES

### 8.1 COMMUNICATIONS

- A. Except as may be otherwise provided in these General Conditions or the Supplementary General Conditions, the CITY will issue all its communications to the CONTRACTOR through the ENGINEER.

### 8.2 PAYMENTS

- A. The CITY will make payments to the CONTRACTOR as provided in Article 14.

### 8.3 LANDS, EASEMENTS, AND SURVEYS

- A. The CITY’s duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.1 and 4.6.

### 8.4 REPORTS AND DRAWINGS

- A. The CITY will identify and make available to the CONTRACTOR copies of reports of physical conditions at the Site and drawings of existing structures which have been utilized in preparing the Contract Documents as set forth in Paragraph 4.2.

### 8.5 CHANGE ORDERS

- A. The CITY will execute Change Orders as indicated in Article 10.

### 8.6 INSPECTIONS AND TESTS

- A. The CITY’S responsibility for inspections and tests is set forth in Paragraph 13.3.

### 8.7 SUSPENSION OF WORK

- A. The CITY’s right to stop work or suspend work is set forth in Paragraphs 13.4 and 15.1.

## 8.8 TERMINATION OF AGREEMENT

- A. The CITY's right to terminate services of the CONTRACTOR is set forth in Paragraphs 15.2 and 15.3.

## 8.9 LIMITATION ON CITY'S RESPONSIBILITIES

- A. The CITY shall not supervise, direct or have control or authority over, nor be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the WORK. CITY will not be responsible for CONTRACTOR's failure to perform or furnish the WORK in accordance with the Contract Documents.

## 8.10 UNDISCLOSED HAZARDOUS ENVIRONMENTAL CONDITIONS

- A. CITY's responsibility in respect to an undisclosed hazardous environmental condition is set forth in Paragraph 4.5.

## ARTICLE 9 – ENGINEER’S STATUS DURING CONSTRUCTION

### 9.1 CITY’S REPRESENTATIVE

- A. The ENGINEER will be the CITY’S representative during the construction period. The ENGINEER shall decide any and all questions which may arise as to the quality or acceptability of materials furnished and work performed, and as to the manner of performance and rate of progress of the work; all questions which arise as to the interpretation of the plans and specifications, the proposal and the contract documents therefor; all questions as to the acceptable fulfillment of the contract on the part of the CONTRACTOR; and all questions as to claim and compensation.

### 9.2 OBSERVATIONS ON THE SITE

- A. The ENGINEER will make observations on the Site during construction to monitor the progress and quality of the WORK and to determine, in general, if the WORK is proceeding in accordance with the Contract Documents. The ENGINEER will not be required to make exhaustive or continuous inspections to check the quality or quantity of the WORK.

### 9.3 PROJECT REPRESENTATION

- A. The ENGINEER may furnish a Resident Project Representative to assist in observing the performance of the WORK. The duties, responsibilities, and limitations of authority of any such Resident Project Representative will be as provided in the Supplementary General Conditions.

### 9.4 CLARIFICATIONS

- A. The ENGINEER will issue with reasonable promptness such written Clarifications of the requirements of the Contract Documents as the ENGINEER may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

### 9.5 AUTHORIZED VARIATIONS IN WORK

- A. The ENGINEER may authorize variations in the WORK from the requirements of the Contract Documents. These may be accomplished by a Field Order and will require the CONTRACTOR to perform the WORK involved in a manner that minimizes the impact to the WORK and the Contract Times. If the CONTRACTOR believes that a Field Order justifies an increase in the Contract Price or an extension of the Contract Times, the CONTRACTOR may make a claim therefor as provided in Article 11 or 12.

## 9.6 REJECTING DEFECTIVE WORK

- A. The ENGINEER will have authority to reject Defective Work and will also have authority to require special inspection or testing of the WORK as provided in Article 13.

## 9.7 CONTRACTOR SUBMITTALS, CHANGE ORDERS, AND PAYMENTS

- A. In accordance with the procedures set forth in the General Requirements, the ENGINEER will review all CONTRACTOR submittals.
- B. The ENGINEER's responsibilities for Change Orders are set forth in Articles 10, 11, and 12.
- C. The ENGINEER's responsibilities for Applications for payment are set forth in Article 14.

## 9.8 DECISIONS ON DISPUTES

- A. The ENGINEER will be the initial interpreter of the requirements of the Contract Documents and of the acceptability of the WORK thereunder. Claims, disputes, and other matters relating to the acceptability of the WORK and interpretation of the requirements of the Contract Document pertaining to the performance of the work shall be determined by the ENGINEER. Any claims in respect to changes in the Contract Price or Contract Times shall be resolved in accordance with the requirements set forth in Articles 10, 11, and 12.

## 9.9 LIMITATIONS ON ENGINEER'S RESPONSIBILITIES

- A. Neither the ENGINEER's authority to act under this Article 9 or other provisions of the Contract Documents nor any decision made by the ENGINEER in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of the ENGINEER to the CONTRACTOR, any Subcontractor, any Supplier, any surety for any of them, or any other person or organization performing any of the WORK.
- B. Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as reviewed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," or "satisfactory," or adjectives of like effect or import are used to describe a requirement, direction, review, or judgment will be solely to evaluate the WORK for compliance with the requirements of the Contract Documents, and conformance with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents, unless there is a specific statement indicating otherwise. The use of any such term or adjective shall not be effective to assign to the ENGINEER any duty or authority

to supervise or direct the performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.9 C.

- C. The ENGINEER will not supervise, direct, control, or have authority over or be responsible for the CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of the CONTRACTOR to comply with Laws and Regulations applicable to the performance of the WORK. The ENGINEER will not be responsible for the CONTRACTOR's failure to perform the WORK in accordance with the Contract Documents. The ENGINEER will not be responsible for the acts or omissions of the CONTRACTOR nor of any Subcontractor, Supplier, or any other person or organization performing any of the WORK.

## **ARTICLE 10 – CHANGES IN THE WORK**

### **10.1 GENERAL**

- A. Without invalidating the Agreement and without notice to any surety, the CITY may at any time or from time to time, order additions, deletions, or revisions in the WORK. Such additions, deletions or revisions will be authorized by a Change Order or Field Order. Upon receipt of any such document, CONTRACTOR shall promptly proceed to implement the additions, deletions, or revisions in the WORK in accordance with the applicable conditions of the Contract Documents.
- B. The CONTRACTOR shall not be entitled to an increase in the contract Price nor an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented by Change Order, except in the case of an emergency and except in the case of uncovering work as provided in Paragraph 13.3.F and G.
- C. The CITY and the CONTRACTOR shall execute appropriate Change Orders covering:
  - 1. Changes in the WORK which are ordered by the CITY pursuant to Paragraph 10.1 A.;
  - 2. Changes required because of acceptance of Defective Work under Paragraph 13.6; and
  - 3. Changes in the Contract Price or Contract Times which are agreed to by the parties under Articles 11 and/or 12, respectively.
- D. If notice of any change in the WORK is required to be given to a surety, the giving of any such notice shall be the CONTRACTOR's responsibility. If the change in the WORK affects the Contract Price, the CITY may require an



adjustment to the amount of any applicable Bond and the amount of each applicable Bond shall be adjusted accordingly.

- E. If the CITY and CONTRACTOR agree as to the extent, if any, of an increase in the Contract Price or an extension or shortening of the Contract Times that should be allowed as a result of a Field Order, the CONTRACTOR shall proceed so as to minimize the impact on and delays to the WORK pending the issuance of a Change Order.
- F. If the CITY and the CONTRACTOR are unable to agree as to the extent, if any, of an increase in the Contract Price or an extension or shortening of the Contract Times that should be allowed as a result of a Field Order, the ENGINEER can direct the CONTRACTOR to proceed on the basis of time and materials so as to minimize the impact on and delays to the WORK, and the CONTRACTOR may make a claim as provided in Articles 11 and 12.

## 10.2 ALLOWABLE QUANTITY VARIATIONS

- A. In the event of an increase or decrease in the quantity of any bid item under a unit price contract, the total amount of work actually done or materials or equipment furnished will be paid for according to the unit price established for such work under the Contract Documents, wherever such unit price has been established; provided, that an adjustment in the Contract Price may be made for changes which result in an increase or decrease in excess of 25 percent of the estimated quantity of any unit price bid item of the WORK.
- B. In the event a part of the WORK is to be entirely eliminated and no lump sum or unit price is named in the Contract Documents to cover such eliminated work, the price of the eliminated work shall be agreed upon by the CITY and the CONTRACTOR by Change Order.

## ARTICLE 11 – CHANGE OF CONTRACT PRICE

### 11.1 GENERAL

- A. The Contract Price constitutes the total compensation payable to the CONTRACTOR FOR PERFORMING THE work. All duties, responsibilities, and obligations assigned to or undertaken by the CONTRACTOR to complete the WORK shall be at its expense without change in the Contract Price.
- B. The Contract Price may only be changed by a Change Order. The value of any work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:

1. Where the work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved.
  2. By mutual acceptance of a lump sum, which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.4; or
  3. On the basis of the cost of work (determined as provided in Paragraph 11.3) plus the CONTRACTOR's overhead and profit (determined as provided in Paragraph 11.4).
- C. Any claim for an increase in the Contract Price shall be based on written notice delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than 10 days) after the start of the event giving rise to the claim and shall state the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within 60 days after the start of such event (unless the ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR's written statement that the amount claimed covers all known amounts (direct, indirect, and consequential) to which the CONTRACTOR is entitled as a result of such event. All claims for adjustment in the Contract Price will be determined by the ENGINEER. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this Paragraph 11.1 C.

## 11.2 COSTS RELATING TO WEATHER

- A. The CONTRACTOR shall have no claims against the CITY for damages for any injury to work, materials, or equipment, resulting from the action of the elements. If, however, in the opinion of the ENGINEER, the CONTRACTOR has made all reasonable efforts to protect the materials, equipment, and work, the CONTRACTOR may be granted a reasonable extension of Contract Times to make proper repairs, renewals, and replacements of the work, materials, or equipment.

## 11.3 COST OF WORK (BASED ON TIME AND MATERIALS)

- A. **General:** The term "cost of work" means the sum of all costs necessarily incurred and paid by the CONTRACTOR for labor, materials, and equipment in the proper performance of extra work. Except as otherwise may be agreed to in writing by the CITY, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in Paragraph 11.5.
- B. **Labor:** The costs of labor will be the actual cost for wages prevailing for each craft or type of workers performing the extra work at the time the extra work is

done, plus employer payments of payroll taxes, workers compensation insurance, liability insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from federal, state or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. Labor costs for equipment operators and helpers will be paid only when such costs are not included in the invoice for equipment rental. The labor costs for foremen shall be proportioned to all of their assigned work and only that applicable to extra work shall be paid. Nondirect labor costs including superintendence shall be considered part of the markup set out in Paragraph 11.4.

C. **Materials:** Materials must be specifically authorized by the ENGINEER. The cost of materials reported shall be at invoice or lowest current price at which materials are locally available and delivered to the Site in the quantities involved, plus the cost of freight, delivery and storage, subject to the following:

1. All trade discounts and rebaters shall accrue to the CITY, and the CONTRACTOR shall make provisions so that they may be obtained;
2. For materials secured by other than a direct purchase and direct billing to the purchaser, the cost shall be deemed to be the price paid to the actual supplier as determined by the ENGINEER. Except for actual costs incurred in the handling of such materials, markup will not be allowed;
3. Payment for materials from sources owned wholly or in part by the purchaser shall not exceed the price paid by the purchaser for similar materials from said sources on extra work items or the current wholesale price for such materials delivered to the Site, whichever price is lower; and
4. If in the opinion of the ENGINEER the cost of material is excessive, or the CONTRACTOR does not furnish satisfactory evidence of the cost of such material, then the cost shall be deemed to be the lowest current wholesale price for the quantity concerned delivered to the Site less trade discount. The CITY reserves the right to furnish materials for the extra work and no claim will be allowed by the CONTRACTOR for costs and profit on such materials.

D. **Equipment:** The CONTRACTOR will be paid for the use of equipment at the rental rate listed for such equipment specified in the current California Department of Transportation publication entitled "Labor Surcharge and Equipment Rental Rates." Such rental rate will be used to compute payments for equipment whether the equipment is under the CONTRACTOR's control through direct ownership, leasing, renting, or another method of acquisition. The rental rate to be applied for use of each item of equipment will be the rate resulting in the least total cost to the CITY for the total period of use. If it is deemed necessary by the CONTRACTOR to use equipment not listed in the above-

referenced publication, an equitable rental rate for the equipment will be established by the ENGINEER. The CONTRACTOR may furnish cost data which might assist the ENGINEER in the establishment of the rental rate. Payment for equipment shall be subject to the following:

1. All equipment shall, in the opinion of the ENGINEER, be in good working condition and suitable for the purpose for which the equipment is to be used;
2. Before construction equipment is used on the extra work, the CONTRACTOR shall plainly stencil or stamp an identifying number thereon at a conspicuous location, and shall furnish to the ENGINEER, in duplicate, a description of the equipment and its identifying number;
3. Unless otherwise specified, manufacturer's ratings and manufacturer approved modifications shall be used to classify equipment for determination of applicable rental rates. Equipment which has no direct power unit shall be powered by a unit of at least the minimum rating recommended by the manufacturer;
4. Individual pieces of equipment or tools having a replacement value of \$500 or less, whether or not consumed by use, will be considered to be small tools and no payment will be made therefore.

E. **Equipment Rental Time:** The rental time to be paid for equipment on the Site will be the time the equipment is in productive operation on the extra work being performed and, in addition, will include the time required to move the equipment to the location of the extra work and return it to the original location or to another location requiring no more time than that required to return it to its original location; except, that moving time will not be paid if the equipment is used on other than the extra work, even though located at the Site of the extra work. Loading and transporting costs will be allowed, in lieu of moving time, when the equipment is moved by means other than its own power, except that no payment will be made for loading and transporting costs when the equipment is used at the Site of the extra work on other than the extra work. Rental time will not be allowed while equipment is inoperative due to breakdowns. The rental time of equipment on the work Site will be computed subject to the following:

1. When hourly rates are listed, any part of an hour less than 30 minutes of operation will be considered to be half-hour of operation, and any part of an hour in excess of 30 minutes will be considered one hour of operation;
2. When daily rates are listed, any part of a day less than 4 hours operation will be considered to be half-day of operation. When owner-operated equipment is used to perform extra work to be paid for on a time and

materials basis, the CONTRACTOR will be paid for the equipment and operator, as set forth in Paragraphs 3, 4, and 5, following;

3. Payment for the equipment will be made in accordance with the provisions in Paragraph 11.3 D., herein;
4. Payment for the cost of labor and subsistence or travel allowance will be made at the rates paid by the CONTRACTOR to other workers operating similar equipment already on the Site, or in the absence of such labor, established by collective bargaining agreements for the type of workmen and location of the extra work, whether or not the operator is actually covered by such an agreement. A labor surcharge will be added to the cost of labor described herein accordance with the provisions of Paragraph 11.3 B., herein, which surcharge shall constitute full compensation for payments imposed by state and federal laws and all other payments made to or on behalf of workers other than actual wages; and
5. To the direct cost of equipment rental and labor, computed as provided herein, will be added the allowances for equipment rental and labor as provided in Paragraph 11.4, herein.

F. **Special Services:** Special work or services are defined as that work characterized by extraordinary complexity, sophistication, innovation, or a combination of the foregoing attributes which are unique to the construction industry. The ENGINEER will make estimates for payment for special services and may consider the following:

1. When the ENGINEER and the CONTRACTOR, determine that a special service or work is required which cannot be performed by the forces of the CONTRACTOR or those of any of its Subcontractors, the special service or work may be performed by an entity especially skilled in the work to be performed. After validation of invoices and determination of market values by the ENGINEER, invoices for special services or work based upon the current fair market value thereof may be accepted without complete itemization of labor, material, and equipment rental costs;
2. When the CONTRACTOR is required to perform work necessitating special fabrication or matching process in a fabrication or a machine shop facility away from the Site, the charges for that portion of the work performed at the off-site facility may, by agreement, be accepted as a special service and accordingly, the invoices for the work may be accepted without detailed itemization; and
3. All invoices for special services will be adjusted by deducting all trade discounts. In lieu of the allowances for overhead and profit specified in

Paragraph 11.4, herein, an allowance of 15 percent will be added to invoices for special services.

- G. **Sureties;** All work performed hereunder shall be subject to all provisions of the Contract Documents and the CONTRACTOR's sureties shall be bound with reference thereto as under the original Agreement. Copies of all amendments to Bonds or supplemental Bonds shall be submitted to the CITY for review prior to the performance of any work hereunder.

#### 11.4 CONTRACTOR'S OVERHEAD AND PROFIT

- A. Extra work ordered on the basis of time and materials will be paid for at the actual necessary cost as determined by the ENGINEER, plus allowances for overhead and profit. No additional mark-ups and/or surcharges will be added to the cost. The allowance for overhead and profit will include full compensation for superintendence, taxes, field office expense, extended overhead, home office overhead, and all other items of expense or cost not included in the cost of labor, materials, or equipment provided for under Paragraph 11.3. The allowance for overhead and profit will be made in accordance with the following schedule:

##### Overhead and Profit Allowance

Labor ..... 20 percent  
Materials ..... 15 percent  
Equipment... 15 percent

To the sum of the costs and markups provided for in this Article, an additional 2 percent of the sum will be added as compensation for Bonds and insurance.

- B. It is understood that labor, materials, and equipment for extra work may be furnished by the CONTRACTOR or by the Subcontractor on behalf of the CONTRACTOR. When all or any part of the extra work is performed by a Subcontractor, the allowance specified herein will be applied to the labor, materials, and equipment costs of the Subcontractor, to which the CONTRACTOR may add 5 percent of the Subcontractor's total cost for the extra work. Regardless of the number of hierarchical tiers of Subcontractors, the 5 percent increase above the Subcontractor's total cost which includes the allowances for overhead and profit specified herein may be applied one time only.

#### 11.5 EXCLUDED COSTS

- A. The term "cost of the work" shall not include any of the following:
  - 1. Payroll costs and other compensation of CONTRACTOR's officers, executives, proprietors, partners, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and

contracting agents, expeditors, timekeepers, clerks, and other personnel employed by CONTRACTOR whether at the Site or in CONTRACTOR's principal or a branch office for general administration of the WORK all of which are to be considered administrative costs covered by the CONTRACTOR's allowance for overhead and profit;

2. Non-direct labor costs, including superintendence, shall be considered part of the markup for overhead and profit, and no additional payment will be allowed for such;
3. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site;
4. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the WORK and charges against CONTRACTOR for delinquent payments;
5. Cost of premiums for all Bonds and for all insurance whether or no CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except as provided by Paragraph 11.4 above);
6. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of Defective Work, disposal of materials or equipment wrongly supplied, and making good any damages to property; and
7. Other overhead or general expense costs of any kind and the cost of any item not specifically and expressly included in Paragraph 11.4.

## 11.6 CONTRACTOR'S EXTRA WORK REPORT

- A. In order to be paid for extra work, the CONTRACTOR must submit a daily extra work report on the form furnished by the ENGINEER. The form must be completely filled out based on the provisions of Paragraphs 11.3 through 11.5 and signed by the CONTRACTOR and ENGINEER at the end of each work day. Failure to complete the form and obtain appropriate signatures by the next working day after the extra work of the previous day was completed will result in CONTRACTOR's costs for extra work being disallowed.

## ARTICLE 12 – CHANGE OF CONTRACT TIMES

### 12.1 GENERAL

- A. The Contract Times may only be changed by a Change Order. Any claim for an extension of the Contract Times shall be based on written notice delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than 10 days) after the start of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within 30 days after the start of such event (unless the ENGINEER allows an additional period of time for the submission of additional or more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR's written statement that the adjustment claimed is the entire adjustment to which the CONTRACTOR is entitled as a result of said event. All claims for adjustment in the Contract Times will be determined by the ENGINEER. No claim for an adjustment in the Contract Times will be valid if not submitted in accordance with the requirements of this Paragraph 12.1 A. An increase in Contract Times does not mean that the CONTRACTOR is due an increase in Contract Price. Only compensable time extensions will result in an increase in Contract Price.
- B. All time limits stated in the Contract Documents are of the essence of the Agreement.
- C. When CONTRACTOR is prevented from completing any part of the WORK within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost on the critical path of the WORK due to such delay, if a claim is made therefor as provided in Paragraph 12.1.A. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by CITY; acts or neglect of those performing other work as contemplated by Article 7; and fires, floods, epidemics, abnormal weather conditions, or acts of God. Delays attributable to and within the control of any Subcontractor or Supplier shall be deemed to be delays within the control of the CONTRACTOR.
- D. In no event will CITY be liable to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them, for any increase in the Contract Price or other damages arising out of or resulting from the following:
1. Delays caused by or within the control of CONTRACTOR; or
  2. Delays beyond the control of both CITY and CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts or neglect by those performing other work as contemplated by Article 7.



12.2 EXTENSIONS OF CONTRACT TIMES FOR DELAY DUE TO WEATHER

- A. The CONTRACTOR’s construction schedule shall anticipate delay due to unusually severe weather. The number of days of anticipated delay is set forth in the Supplementary General Conditions.
- B. Contract Times may be extended by the ENGINEER because of delays in excess of the anticipated delay. The CONTRACTOR shall , within 10 days of the beginning of any such delay, notify the ENGINEER in writing and request an extension of Contract Times. The ENGINEER will ascertain the facts and the extent of the delay and extend the Contract Times when, in its judgment, the findings of the fact justify such an extension.

**ARTICLE 13 – INSPECTIONS AND TESTS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK**

13.1 NOTICE OF DEFECTIVE WORK

- A. Prompt notice of Defective Work known to the ENGINEER will be given to the CONTRACTOR. All Defective Work, whether or not in place, may be rejected, corrected, or accepted as provided in this Article 13. Defective Work may be rejected even if approved by prior inspection.

13.2 ACCESS TO WORK

- A. ENGINEER and other representatives and personnel of CITY, independent testing laboratories, and governmental agencies with jurisdictional interests shall have access to the WORK at reasonable times for their observation, inspecting, and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR’s Site safety procedures and programs so that they may comply therewith as applicable.

13.3 INSPECTIONS AND TESTS

- A. The CONTRACTOR shall give the ENGINEER not less than 24 hours notice of readiness of the WORK for all required inspections, tests, or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. The CITY shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
  - 1. For inspection, tests, or approvals covered by Paragraphs 13.3C. and 13.3D. below;

2. That costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.3G. shall be paid as provided in said Paragraph 13.3G.; and
  3. As otherwise provided in the Contract Documents.
- C. If Laws and Regulations of any public body having jurisdiction require any WORK (or any part thereof) to be inspected, tested, or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests or approvals; pay all costs in connection therewith; and furnish the ENGINEER the required certificates of inspection or approval.
- D. The CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for the ENGINEER's acceptance of materials or equipment to be incorporated in the WORK or acceptance of materials, mix designs, or equipment submitted for approval prior to the CONTRACTOR's purchase thereof for incorporation in the WORK. Such inspections, tests, or approvals shall be performed by organizations acceptable to the ENGINEER.
- E. The ENGINEER will make, or have made, such inspections and tests as the ENGINEER deems necessary to see that the WORK is being accomplished in accordance with the requirements of the Contract Documents. Unless otherwise specified in any Supplementary General Conditions, the cost of such inspection and testing will be borne by the CITY. In the event such inspections or tests reveal non-compliance with the requirements of the Contract Documents, the CONTRACTOR shall bear the cost of corrective measures deemed necessary by the ENGINEER, as well as the cost of subsequent reinspection and retesting. Neither observations by the ENGINEER nor inspections, tests, or approvals by others shall relieve the CONTRACTOR from the CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents.
- F. If any WORK (including the work of others) that is to be inspected, tested, or approved is covered without written concurrence of the ENGINEER, it must, if requested by the ENGINEER, be uncovered for observation. Such uncovering shall be at the CONTRACTOR's expense unless the CONTRACTOR has given the ENGINEER not less than 24 hours notice of the CONTRACTOR's intention to perform such test or to cover the same and the ENGINEER has not acted with reasonable promptness in response to such notice.
- G. If any WORK is covered contrary to the written request of the ENGINEER, it must, if requested by the ENGINEER, be uncovered for the ENGINEER's observation and recovered at the CONTRACTOR's expense.

- H. If the ENGINEER considers it necessary or advisable that covered WORK be observed by the ENGINEER or inspected or tested by others, the CONTRACTOR, at the ENGINEER's request shall uncover, expose, or otherwise make available for observation, inspection, or testing as the ENGINEER may require, that portion of the WORK in question, furnishing all necessary labor, material, and equipment. If it is found that such work is Defective Work, the CONTRACTOR shall bear all direct, indirect, and consequential costs and damages of such uncovering, exposure, observation, inspection, and testing and of satisfactory reconstruction, including but not limited to, fees and charges of engineers, architects, attorneys, and other professionals. However, if such work is not found to be Defective Work, the CONTRACTOR will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, and reconstruction; and, if the parties are unable to agree as to the amount or extent thereof, the CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.
- I. No acceptance of equipment, materials, or work shall be construed to result from such inspections by the ENGINEER. Any inspections or tests or waivers thereof shall not relieve the CONTRACTOR of its responsibility for meeting the requirement of the Contract.

#### 13.4 CITY MAY STOP THE WORK

- A. If Defective Work is identified, the ENGINEER may order the CONTRACTOR to stop performance of the WORK, or any portion thereof, until the cause for such order has been eliminated; however, this right of the ENGINEER to stop the WORK shall not give rise to any duty on the part of the ENGINEER to exercise this right for the benefit of the CONTRACTOR or any other party.

#### 13.5 CORRECTION OR REMOVAL OF DEFECTIVE WORK

- A. If required by the ENGINEER, the CONTRACTOR shall promptly either correct all Defective Work, whether or not fabricated, installed, or completed, or, if the work has been rejected by the ENGINEER, remove it from the Site and replace it with non-defective WORK. The CONTRACTOR shall bear all direct, indirect, and consequential costs and damages of such correction or removal, including but not limited to fees and charges of engineers, architects, attorneys, and other professionals made necessary thereby.

#### 13.6 ACCEPTANCE OF DEFECTIVE WORK

- A. If, instead of requiring correction or removal and replacement of Defective Work, the CITY prefers to accept the Defective Work, the CITY may do so. The CONTRACTOR shall bear all direct, indirect, and consequential costs attributable to the CITY's evaluation of and determination to accept such Defective Work. If

any such acceptance occurs prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the WORK, and the CITY shall be entitled to an appropriate decrease in the Contract Price.

### 13.7 CITY MAY CORRECT DEFECTIVE WORK

- A. If the CONTRACTOR fails within a reasonable time after written notice from the ENGINEER to correct Defective Work, or to remove and replace Defective Work as required by the ENGINEER in accordance with Paragraph 13.5A., or if the CONTRACTOR fails to perform the WORK in accordance with the Contract Documents, or if the CONTRACTOR fails to comply with any other provision of the Contract Documents, the CITY may, after seven days written notice to the CONTRACTOR, correct and remedy any such deficiency.
- B. In exercising the rights and remedies under this paragraph, the CITY shall proceed with corrective and remedial action. In connection with such corrective and remedial action, the CITY may exclude the CONTRACTOR from all or part of the Site, take possession of all or part of the WORK, and suspend the CONTRACTOR's services related thereto and incorporate in the WORK all materials and equipment for which the CITY has paid the CONTRACTOR whether stored at the Site or elsewhere. The CONTRACTOR shall provide the CITY and its ENGINEER, access to the Site to enable CITY to exercise the rights and remedies under this paragraph.
- C. All direct, indirect, and consequential cost and damages incurred by the CITY in exercising the rights and remedies under this paragraph will be charged against the CONTRACTOR and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the WORK; and the CITY shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, the CITY may make a claim therefor as provided in Article 11. Such claim will include, but not be limited to, all costs of repair or replacement of work of others, destroyed or damaged by correction, removal, or replacement of CONTRACTOR's Defective Work and all direct, indirect, and consequential damages associated therewith.
- D. The CONTRACTOR shall not be allowed an extension of Contract Times (or Milestones) because of any delay in the performance of the WORK attributable to the exercise by CITY of CITY's rights and remedies under this paragraph.

### 13.8 CORRECTION PERIOD

- A. The correction period for Defective Work shall be the longer of:
  - 1. One year after the date of final acceptance;

2. Such time as may be prescribed by Laws and Regulations;
  3. Such time as specified by the terms of any applicable special guarantee required by the Contract Documents; or
  4. Such time as specified by any specific provision of the Contract Documents.
- B. If, during the correction period as defined in Paragraph 13.8A above, any work is found to be Defective Work, the CITY shall have the same remedies as set forth in Paragraphs 13.5, 13.6, and 3.7 above.
- C. Where Defective Work (and damage to other work resulting therefrom) has been corrected, removed, or replaced under this paragraph, the correction period hereunder with respect to such work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

## **ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION**

### **14.1 SCHEDULE OF VALUES (LUMP SUM PRICE BREAKDOWN)**

- A. The schedule of values or lump sum price breakdown established as provided in the General Requirements shall serve as the basis for progress payments and shall be incorporated into a form of “Application for Payment acceptable to the ENGINEER.

### **14.2 UNIT PRICE BID SCHEDULE**

- A. Progress payments on account of unit price work will be based on the number of units completed.

### **14.3 APPLICATION FOR PROGRESS PAYMENT**

- A. Unless otherwise prescribed by law, on the 25th of each month, the CONTRACTOR shall submit to the ENGINEER for review, the Application for Payment filled out and signed by the CONTRACTOR covering the WORK completed as of the Application for Payment and accompanied by such supporting documentation as is required by the Contract Documents.
- B. The Application for Payment shall identify, as a subtotal, the amount of the CONTRACTOR total earnings to date; plus the value of materials stored at the Site which have not yet been incorporated in the WORK; and less a deductive adjustment for materials installed which were not previously incorporated in the WORK, but for which payment was allowed under the provisions for payment for materials stored at the Site, but not yet incorporated in the WORK.

- C. The net payment due the CONTRACTOR shall be the above-mentioned subtotal from which shall be deducted the amount of retainage specified in the Supplementary General Conditions and the total amount of all previous payments made to the CONTRACTOR.
- D. The value of materials stored at the Site shall be an amount equal to the specified percent of the value of such materials as set forth in any Supplementary General Conditions. Said amount shall be based upon the value of all acceptable materials and equipment not incorporated in the WORK but delivered and suitably stored at the Site or at another location agreed to in writing; provided, each such individual item has a value of more than \$5,000 and will become a permanent part of the WORK. The Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that the CONTRACTOR has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect the CITY's interest therein, all of which will be satisfactory to the CITY.
- E. A ten percent (10%) retention of payment amount shall be held by the CITY from the amount of each Application for Payment.
- F. **OPTIONAL:** Partial payments for mobilization/demobilization costs shall be as follows:
  - 1. Thirty-five percent (35%) of the amount bid for mobilization/demobilization or 1.75 percent of the original Contract Price, whichever is less, shall be paid in each of the first two progress payments.
  - 2. The balance of the amount bid for mobilization/demobilization shall be paid upon completion of all WORK on the project.

#### 14.4 CONTRACTOR'S WARRANTY OF TITLE

- A. The CONTRACTOR warrants and guarantees that title to all WORK, materials, and equipment covered by an Application for Payment, whether incorporated in the WORK or not, will pass to the CITY no later than the time of payment, free and clear of all Liens.

#### 14.5 REVIEW OF APPLICATIONS FOR PROGRESS PAYMENT

- A. The ENGINEER will, within 7 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the application to the CITY, or return the application to the CONTRACTOR indicating in writing the ENGINEER'S REASONS FOR REFUSING TO RECOMMEND PAYMENT. In the latter case, the CONTRACTOR may make

the necessary corrections and resubmit the application. If the ENGINEER still disagrees with a portion of the application, it will submit the application recommending the undisputed portion of the application to the CITY for payment and provide reasons for recommending non-payment of the disputed amount. Thirty days after presentation of the Application for Payment with the ENGINEER'S recommendation, the amount recommended will (subject to the provisions of Paragraph 14.5B.) become due and when due will be paid by the CITY to the CONTRACTOR.

- B. The ENGINEER, in its discretion, may refuse to recommend the whole or any part of any payment. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in ENGINEER's opinion to protect CITY from loss because:
1. The work is Defective Work or the completed WORK has been damaged requiring correction or replacement.
  2. The Contract Price has been reduced by written amendment or Change Order.
  3. The CITY has been required to correct Defective Work or complete WORK in accordance with Paragraph 13.7.
  4. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.1 through 15.4 inclusive.
  5. Third party claims filed or reasonable evidence indicating probable filing of such claims; or
  6. Failure of the Contractor to make payments properly to subcontractors or for labor, materials, or equipment; or
  7. Reasonable evidence that the work cannot be completed for the unpaid balance of the contract sum; or
  8. Failure of the Contractor to submit an acceptable construction schedule or failure to update the schedule; or
  9. Damage to the City or another contractor; or
  10. Reasonable evidence that the work will not be completed within the time provided for in the Contract; or

11. Contractor's failure or inability to obtain or maintain insurance coverage and bonds as required by the Contract throughout the course of the job; or
  12. Persistent failure to carry out the work in accordance with the Contract; or
  13. Failure to deliver copies of certified payrolls, as specified in Section 17.11, General Conditions.
  14. In addition, the City may deduct from any such payments due the Contractor any amounts the City may be currently or in the future authorized to retain pursuant to federal, state, or local laws or regulations, any amounts due the City from the Contractor, and any other amounts which the City is otherwise authorized to retain as specified in Special Provisions.
- C. The CITY may refuse to make payment of the full amount recommended by the ENGINEER because:
1. Claims have been made against CITY on account of CONTRACTOR's performance or furnishing of the WORK.
  2. Liens have been filed in connection with the WORK, except where CONTRACTOR has delivered a specific Bond satisfactory to CITY to secure the satisfaction and discharge of such Liens.
  3. There are other items entitling CITY to set-off against the amount recommended, or
  4. CITY has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.5B. through 14.5C and 15.1 through 15.4 inclusive.

The CITY must give the CONTRACTOR immediate written notice stating the reasons for such action and promptly pay the CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by CITY and CONTRACTOR, when CONTRACTOR corrects to CITY's satisfaction the reasons for such action.

#### 14.6 COMPLETION

- A. When the CONTRACTOR considers the WORK ready for its intended use, the CONTRACTOR shall notify the ENGINEER in writing that the WORK is complete. The CONTRACTOR shall attach to this request a list of all work items that remain to be completed and a request that the ENGINEER prepare a Notice of Completion. Within a reasonable time thereafter, the CONTRACTOR, and the ENGINEER shall make an inspection of the WORK to determine the status of completion. If the ENGINEER considers the WORK complete, the ENGINEER



will prepare and execute and deliver for City Council approval and recordation the Notice of Completion signed by the ENGINEER and CONTRACTOR, which shall fix the date of completion.

#### 14.7 PARTIAL UTILIZATION

- A. The CITY shall have the right to utilize or place into service any item of equipment or other usable portion of the WORK prior to completion of the WORK. Whenever the CITY plans to exercise said right, the CONTRACTOR will be notified in writing by the ENGINEER, identifying the specific portion or portions of the WORK to be so utilized or otherwise placed into service.
- B. It shall be understood by the CONTRACTOR that until such written notification is issued, all responsibility for care and maintenance of all of the WORK shall be borne by the CONTRACTOR. Upon issuance of said written notice of Partial Utilization, the CITY will accept responsibility for the protection and maintenance of all such items or portions of the WORK described in the written notice.
- C. The CONTRACTOR shall retain full responsibility for satisfactory completion of the WORK, regardless of whether a portion thereof has been partially utilized by the CITY prior to completion of the WORK.

#### 14.8 FINAL APPLICATION FOR PAYMENT

- A. After the CONTRACTOR has completed all of the remaining work items referred to in Paragraph 14.6 and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, marked-up record documents (as provided in the General Requirements), and other documents, all as required by the Contract Documents, and after the ENGINEER has indicated that the WORK is acceptable, the CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers (satisfactory to the CITY) of all Liens arising out of or filed in connection with the WORK.

#### 14.9 FINAL PAYMENT AND ACCEPTANCE

- A. If, on the basis of the ENGINEER's observation of the WORK during construction and final inspection, and the ENGINEER's review of the final Application for Payment and accompanying documentation, all as required by the Contract Documents, the ENGINEER is satisfied that the WORK has been completed and the CONTRACTOR's other obligations under the Contract Documents have been fulfilled, the ENGINEER will, within 14 days after receipt

of the final Application for Payment, indicate in writing the ENGINEER's recommendation of payment and present the application to the CITY for payment.

- B. After acceptance of the WORK by the City Council, the CITY will make final payment to the CONTRACTOR of the amount remaining after deducting all prior payments and all amounts to be kept or retained under the provisions of the Contract Documents, including the following items:
1. Liquidated damages, as applicable;
  2. Amounts withheld by CITY under Paragraph 14.5B. and C. which have not been released; and
  3. In accordance with Section 17.6, one-and-one-half times the value of outstanding items of correction work or punch list items yet uncompleted or uncorrected, as applicable. All such work shall be completed or corrected to the satisfaction of the ENGINEER as required by the Contract Documents, otherwise the CONTRACTOR does hereby waive any and all claims to all monies withheld by the CITY to cover the value of all such uncompleted or uncorrected items.
- C. Prior to final payment by the CITY, the CONTRACTOR must provide the CITY a fully-executed Conditional Waiver and Release Upon Final Payment in accordance with California Civil Code Section 3262.

## ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

### 15.1 SUSPENSION OF WORK BY CITY

- A. The CITY may, at any time and without cause, suspend the WORK or any portion thereof for a period of not more than 90 days by notice in writing to the CONTRACTOR. The CONTRACTOR shall resume the WORK on receipt of a notice of resumption of work. The CONTRACTOR will be allowed an increase in the Contract Price or an extension of the Contract Time, or both directly attributable to any suspension if the CONTRACTOR makes an approval claim therefor as provided in Articles 11 and 12.

### 15.2 TERMINATION OF AGREEMENT BY ENGINEER FOR DEFAULT

- A. In the event of default by the CONTRACTOR, the ENGINEER may give seven days written notice to the CONTRACTOR and the CONTRACTOR's surety of CITY's intent to terminate the Agreement and provide the CONTRACTOR an opportunity to remedy the conditions constituting the default within a specified period of time. It will be considered a default by the CONTRACTOR whenever CONTRACTOR shall:
1. Declare bankruptcy, become insolvent, or assign its assets for the benefit of its creditors;
  2. Disregard or violate the Laws or Regulations of any public body having jurisdiction;
  3. Fail to provide materials or workmanship meeting the requirements of the Contract Documents;
  4. Disregard or violate provisions of the Contract Documents or ENGINEER's instructions;
  5. Fail to prosecute the WORK according to the approved progress schedule;
  6. Fail to provide a qualified superintendent, competent workmen, or materials or equipment meeting the requirements of the Contract Documents;
  7. Disregard the authority of the ENGINEER; or
  8. Assign or subcontract any part of the work without the ENGINEER's consent.
- B. If the CONTRACTOR fails to remedy the conditions constituting default within the time allowed, the ENGINEER may then issue the notice of termination.

- C. In the event the Agreement is terminated in accordance with Paragraph 15.2A., herein, the CITY may take possession of the WORK and may complete the WORK by whatever method or means the CITY may select. The cost of completing the WORK will be deducted from the balance which would have been due the CONTRACTOR had the Agreement not been terminated and the WORK completed in accordance with the Contract Documents. If such cost exceeds the balance which would have been due, the CONTRACTOR shall pay the excess amount to the CITY. If such cost is less than the balance which would have been due, the CONTRACTOR shall not have claim to the difference.

### 15.3 TERMINATION OF AGREEMENT BY CITY FOR CONVENIENCE

- A. Upon seven days' written notice to the CONTRACTOR, the CITY may, without cause and without prejudice to any other right or remedy of the CITY, elect to terminate the Agreement. In such case, the CONTRACTOR shall be paid (without duplication of any items):
  - 1. For completed and acceptable WORK executed in accordance with the Contract Documents, prior to the effective date of termination, including fair and reasonable sums for overhead and profit of such WORK;
  - 2. For expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted WORK, plus fair and reasonable sums or overhead and profit on such expenses;
  - 3. For all reasonable claims, costs, losses, and damages incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
  - 4. For reasonable expenses directly attributable to termination.

CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

### 15.4 TERMINATION OF AGREEMENT BY CONTRACTOR

- A. The CONTRACTOR may terminate the Agreement upon 14 days written notice to the ENGINEER whenever:
  - 1. The WORK has been suspended under the provisions of Paragraph 15.1, herein, for more than 90 consecutive days through no fault or negligence of the CONTRACTOR, and notice to resume work or to terminate the

Agreement has not been received from the ENGINEER within this time period; or

2. The CITY should fail to pay the CONTRACTOR any monies due him in accordance with the terms of the Contract Documents and within 60 days after presentation to the ENGINEER by the CONTRACTOR of a request therefor, unless within said 14-day period the CITY shall have remedied the condition upon which the payment delay was based.
- B. In the event of such termination, the CONTRACTOR shall have no claims against the CITY except for those claims specifically enumerated in Paragraph 15.3, herein, and as determined in accordance with the requirements of said paragraph.

## **ARTICLE 16 – GENERAL TERMS**

### **16.1 GIVING NOTICE**

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

### **16.2 TITLE TO MATERIALS FOUND ON THE WORK**

- A. The CITY reserves the right to retain title to all soils, stone, sand, gravel, and other materials developed and obtained from excavations and other operations connected with the WORK. Unless otherwise specified in the Contract Documents, neither the CONTRACTOR nor any Subcontractor shall have any right, title, or interest in or to any such materials. The CONTRACTOR will be permitted to use in the WORK, without charge, any such materials which meet the requirements of the Contract Documents.

### **16.3 RIGHT TO AUDIT**

- A. If the CONTRACTOR submits a claim to the ENGINEER for additional compensation, the CITY shall have the right, as a condition to considering the claim, and as a basis for evaluation of the claim, and until the claim has been settled, to audit the CONTRACTOR's books to the extent they are relevant. This right shall include the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to discovery and verify all direct and indirect costs of whatever nature claimed to have been incurred or anticipated to be incurred and for which the claim has been submitted. The right to audit shall include the right to inspect the CONTRACTOR's plant or such parts thereof, as may be or have been engaged in the performance of the WORK. The CONTRACTOR further agrees that the right to audit encompasses

all subcontracts and is binding upon Subcontractors. The rights to examine and inspect herein provided for shall be exercisable through such representatives as the CITY deems desirable during the CONTRACTOR's normal business hours at the office of the CONTRACTOR. The CONTRACTOR shall make available to the ENGINEER for auditing, all relevant accounting records and documents, and other financial data, and upon request, shall submit true copies of requested records to the ENGINEER.

#### 16.4 SURVIVAL OF OBLIGATIONS

- A. All representations, indemnifications, warranties, and guaranties made in, required by or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the WORK or termination or completion of the Agreement.

#### 16.5 CONTROLLING LAW

- A. This Agreement is to be governed by the law of the state in which the Project is located.

#### 16.6 SEVERABILITY

- A. If any term or provision of this Agreement is declared invalid or unenforceable by any court of lawful jurisdiction, the remaining terms and provisions of the Agreement shall not be affected thereby and shall remain in full force and effect.

#### 16.7 WAIVER

- A. The waiver by the CITY of any breach or violation of any term, covenant or condition of this Agreement or of any provision, ordinance, or law shall not be deemed to be a waiver of any other term, covenant, condition, ordinance, or law or of any subsequent breach or violation of the same or of any other term, covenant, condition, ordinance, or law. The subsequent payment of any monies or fee by the CITY which may become due hereunder shall not be deemed to be a waiver of any preceding breach or violation by CONTRACTOR or any term, covenant, condition of this Agreement or of any applicable law or ordinance.

## ARTICLE 17 – CALIFORNIA STATE REQUIREMENTS

### 17.1 STATE WAGE DETERMINATIONS

- A. As required by Section 1770 and following, of the California Labor Code, the CONTRACTOR shall pay not less than the prevailing rate of per diem wages as determined by the Director of the California Department of Industrial Relations. Copies of such prevailing rate of per diem wages available file at the office of the City Clerk, which copies shall be made available to any interested party on request. The CONTRACTOR shall post a copy of such determination at each job site.
- B. In accordance with Section 1775 of the California Labor Code, the CONTRACTOR shall, as a penalty to the CITY, forfeit not more than **\$200.00** for each calendar day or portion thereof, for each worker paid less than the prevailing rates as determined by the Director for the work or craft in which the worker is employed for any public work done under the contract by him or her or by any subcontractor under him or her.

### 17.2 WORKERS' COMPENSATION

- A. In accordance with the provisions of Section 3700 of the California Labor Code, the CONTRACTOR shall secure the payment of compensation to its employees.
- B. Prior to beginning work under the Contract, the CONTRACTOR shall sign and file with the ENGINEER the following certification:

“I am aware of the provisions of Section 3700 of the Labor Code, which require every employer to be insured against liability for workers’ compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the WORK of this Contract.”
- C. Notwithstanding the foregoing provisions, before the Contract is executed on behalf of the CITY, a bidder to whom a contract has been awarded shall furnish satisfactory evidence that it has secured in the manner required and provided by law the payment of workers’ compensation.

### 17.3 APPRENTICES ON PUBLIC WORKS

- A. The CONTRACTOR shall comply with all applicable provisions of Section 1777.5 of the California Labor Code relating to employment of apprentices on public works.

#### 17.4 WORKING HOURS

- A. The CONTRACTOR shall comply with all applicable provisions of Section 1810 to 1815, inclusive, of the California Labor Code relating to working hours. The CONTRACTOR shall, as a penalty to the CITY, forfeit \$25.00 for each worker employed in the execution of the Contract by the CONTRACTOR or by any subcontractor for each calendar day during which such worker is required or permitted to work more than 8 hours in any one calendar day and 40 hours in any one calendar week, unless such worker receives compensation for all hours worked in excess of 8 hours at not less than 1-1/2 times the basic rate of pay.

#### 17.5 CONTRACTOR NOT RESPONSIBLE FOR DAMAGE RESULTING FROM CERTAIN ACTS OF GOD

- A. As provided in Section 7105 of the California Public Contract Code, the CONTRACTOR shall not be responsible for the cost of repairing or restoring damage to the WORK which damage is determined to have been proximately caused by an act of God, in excess of 5 percent of the contracted amount, provided, that the WORK damaged was built in accordance with accepted and applicable building standards and the plans and specifications of the CITY. The CONTRACTOR shall obtain insurance to indemnify the CITY for any damage to the WORK caused by an act of God if the insurance premium is a separate bid item in the bidding schedule for the WORK. For purposes of this Section, the term "acts of God" shall include only the following occurrences or conditions and effects: earthquakes in excess of a magnitude of 3.5 on the Richter Scale and tidal waves.

#### 17.6 NOTICE OF COMPLETION

- A. In accordance with the Sections 3086 and 3093 of the California Civil Code, within 10 days after date of acceptance of the WORK BY THE City Council the ENGINEER will file, in the County Recorder's office, a Notice of Completion of the WORK.

#### 17.7 UNPAID CLAIMS

- A. If, at any time prior to the expiration of the period for service of a stop notice, there is served upon the CITY a stop notice as provided in Sections 3179 and 3210 of the California Civil Code, the CITY shall, until the discharge thereof, withhold from the monies under its control so much of said monies due or to become due to the CONTRACTOR under this Contract as shall be sufficient to answer the claim stated in such stop notice and to provide for the reasonable cost of any litigation thereunder; provided, that if the ENGINEER shall, in its discretion, permit CONTRACTOR to file with the ENGINEER the bond referred to in Section 3196 of the Civil Code of the State of California, said monies shall not thereafter be withheld on account of such stop notice.



## 17.8 RETAINAGE FROM MONTHLY PAYMENTS

- A. Pursuant to Section 22300 of the California Public Contract Code, the CONTRACTOR may substitute securities for any money withheld by the CITY to insure performance under the Contract. At the request and expense of the CONTRACTOR, securities equivalent to the amount withheld shall be deposited with the CITY or with a state or federally chartered bank in California as to the escrow agent, who shall return such securities to the CONTRACTOR upon satisfactory completion of the Contract.
- B. Alternatively, the CONTRACTOR may request and the CITY shall make payment of retentions earned directly to the escrow agent at the expense of the CONTRACTOR. At the expense of the CONTRACTOR, the CONTRACTOR may direct the investment of the payments into securities and the CONTRACTOR shall receive the interest earned on the investments upon the same terms provided in Section 22300 of the Public Contract Code securities deposited by the CONTRACTOR. The CONTRACTOR shall be responsible for paying all fees for the expenses incurred by the escrow agent in administering the escrow account and all expenses of the CITY. These expenses and payment terms shall be determined by the CITY's Finance Director or his/her designee and the escrow agent. Upon satisfactory completion of the Contract, the CONTRACTOR shall receive from the escrow agent all securities, interest, and payments received by the escrow agent from the CITY, pursuant to the terms of Section 22300 of the Public Contract Code. The CONTRACTOR shall pay to each subcontractor, not later than 20 days of receipt of the payment, the respective amount of interest earned, net of costs attributed to retention withheld from each subcontractor, on the amount of retention withheld to insure the performance of the CONTRACTOR.
- C. Securities eligible for investment under Section 22300 shall be limited to those listed in Section 16430 of the Government Code and to bank or savings and loan certificates of deposit, interest bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by the CONTRACTOR and the CITY.

## 17.9 PUBLIC WORKS CONTRACTS; ASSIGNMENT TO AWARDING BODY

- A. In accordance with Section 7103.5 of the California Public Contract Code, the CONTRACTOR and Subcontractors shall conform to the following requirements. In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the CONTRACTOR or subcontractor offers and agrees to assign to the CITY all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising

from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the CONTRACTOR, without further acknowledgment by the parties.

17.10 PAYROLL RECORDS; RETENTION; INSPECTION; NONCOMPLIANCE PENALTIES; RULES AND REGULATIONS

- A. In accordance with Section 1776 of the California Labor Code the CONTRACTOR and each Subcontractor shall keep an accurate payroll record, showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by him or her in connection with the public work. Each payroll record shall contain or be verified by a written declaration that it is made under penalty of perjury, stating both of the following:
1. The information contained in the payroll record is true and correct.
  2. The employer has complied with the requirements of Sections 1771, 1811, and 1815 for any work performed by his or her employees on the public works project.
- B. The payroll records shall be certified and shall be available for inspection at all reasonable hours at the principal office of the CONTRACTOR on the following basis:
1. A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request as well as submitted electronically online to the Department of Industrial Relations Labor Commissioner: <https://apps.dir.ca.gov/ecpr/DAS/AltLogin>.
  2. A certified copy of all payroll records shall be made available for inspection or furnished upon request to a representative of the body awarding the contract, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards of the Department of Industrial Relations.
  3. A certified copy of all payroll records shall be made available upon request by the public for inspection or copies thereof made; provided, however, that a request by the public shall be made through either the body awarding the contract, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement. If the requested payroll records have not been provided the requesting party shall, prior to being provided the records, reimburse the costs of preparation by the

CONTRACTOR, Subcontractors, and the entity through which the request was made. The public shall not be given access to the records at the principal office of the CONTRACTOR.

- C. The certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement or shall contain the same information as the forms provided by the division.
- D. Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the awarding body, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address, and social security number. The name and address of the CONTRACTOR awarded the contract or performing the contract shall not be marked or obliterated.
- E. The CONTRACTOR shall inform the ENGINEER of the location of the records including the street address, city and county, and shall, within 5 working days, provide a notice of change of location and address.
- F. The CONTRACTOR shall have 10 days in which to comply subsequent to receipt of written notice specifying in what respects the CONTRACTOR must comply with this Section. In the event that the CONTRACTOR fails to comply within the 10-day period, he or she shall, as a penalty to the state or political subdivision on whose behalf the contract is made or awarded, forfeit twenty-five dollars (\$25.00) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due. A contractor is not subject to a penalty assessment pursuant to this section due to the failure of a subcontractor to comply with this section.

#### 17.11 CULTURAL RESOURCES

- A. The CONTRACTOR's attention is directed to the provisions of the Clean Water Grant Program Bulletin 76A which augments the National Historic Preservation Act of 1966 (16 U.S.C. 470) as specified under Section 01560 - Temporary Environmental Controls, of the General Requirements.

#### 17.12 PROTECTION OF WORKERS IN TRENCH EXCAVATIONS

- A. As required by Section 6705 of the California Labor Code and in addition thereto, whenever work under the Contract involves the excavation of any trench or trenches 5 feet or more in depth, the CONTRACTOR shall submit for acceptance by the ENGINEER, to whom authority to accept has been delegated, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping, or

other provisions to be made for worker protection from the hazard of caving ground during the excavation, of such trench or trenches. If such plan varies from the shoring system standards established by the Construction Safety Orders of the Division of Occupational Safety and Health, the plan shall be prepared by a registered civil or structural engineer employed by the CONTRACTOR, and all costs therefore shall be included in the price named in the Contract for completion of the WORK as set forth in the Contract Documents. Nothing in this Section shall be deemed to allow the use of a shoring, sloping, or other protective system less effective than that required by the Construction Safety Orders. Nothing in this Section shall be construed to impose tort liability on the CITY or any of its officers, agents, representatives, or employees.

- B. Excavation shall not start until the CONTRACTOR has obtained a permit from the California Division of Industrial Safety and has posted it at the site.

#### 17.13 CONCRETE FORMS, FALSEWORK, AND SHORING

- A. The CONTRACTOR shall comply fully with the requirements of Section 1717 of the Construction Safety Orders, State of California, Department of Industrial Relations, regarding the design of concrete forms, falsework and shoring, and the inspection of same prior to placement of concrete. Where the said Section 1717 requires the services of a civil engineer registered in the State of California to approve design calculations and working drawings of the falsework or shoring system, or to inspect such system prior to placement of concrete, the CONTRACTOR shall employ a registered civil engineer for these purposes, and all costs therefore shall be included in the price named in the Contract for completion of the WORK as set forth in the Contract Documents.

#### 17.14 REMOVAL, RELOCATION, OR PROTECTION OF EXISTING UTILITIES

- A. In accordance with the provisions with the provisions of Section 4215 of the California Government Code, the CITY shall assume the responsibility for the timely removal, relocation, or protection of existing main or trunkline utility facilities located on the site of any construction project that is a subject of the Contract, if such utilities are not identified by the CITY in the plans and specifications made a part of the invitation for bids. The CITY will compensate CONTRACTOR for the costs of locating, repairing damage not due to the failure of the CONTRACTOR to exercise reasonable care, and removing or relocating such utility facilities not indicated in the plans and specifications with reasonable accuracy, and for equipment on the project necessarily idled during such work.
- B. The CONTRACTOR shall not be assessed liquidated damages for delay in completion of the project, when such delay was caused by the failure of the public agency or the owner of the utility to provide for removal or relocation of such utility facilities.

- C. Nothing herein shall be deemed to require the public agency to indicate the presence of existing service laterals or appurtenances when the presence of such utilities on the site of the construction project can be inferred from the presence of other visible facilities, such as buildings, meter and junction boxes, on or adjacent to the site of construction; provided however, nothing herein shall relieve the public agency from identifying main or trunklines in the plans and specifications.
- D. If the CONTRACTOR while performing the Contract discovers utility facilities not identified by the public agency in the Contract Documents it shall immediately notify the public agency and utility in writing.
- E. The public utility, where they are the owner, shall have the sole discretion to perform such repairs or relocation work or permit the CONTRACTOR to do such repairs or relocation work at a reasonable price.

#### 17.15 CONTRACTOR LICENSE REQUIREMENTS

- A. In accordance with Section 7028.15 of the California Business and Professions Code:
- B. It is a misdemeanor for any person to submit a bid to a public agency in order to engage in the business or act in the capacity of a contractor within this state without having a license therefor, except in any of the following cases:
  - 1. The person is particularly exempted from this chapter.
  - 2. The bid is submitted on a state project governed by Section 10164 of the Public Contract Code or any local agency project governed by Section 20103.5 of the Public Contract Code.
- C. If a person has previously been convicted of the offense described in this section, the court shall impose a fine of 20 percent of the price of the contract under which the unlicensed person performed contract work, or four thousand five hundred dollars (\$4,500), whichever is greater, or imprisonment in the county jail for not less than 10 days nor more than six months, or both.
- D. In the event the person performing the contracting work has agreed to furnish materials and labor on an hourly basis, “the price of the contract” for the purpose of this subdivision means the aggregate sum of the cost of materials and labor furnished and the cost of completing the work to be performed.
- E. This section shall not apply to a joint venture license, as required by Section 7029.1 of the California Business and Professions Code. However, at the time of making a bid as a joint venture, each person submitting the bid shall be subject to this section with respect to his or her individual licensure.

- F. This section shall not affect the right or ability of a licensed architect, land surveyor, or registered professional engineer to form joint ventures with licensed contractors to render services within the scope of their respective practices.
- G. Unless one of the foregoing exceptions applies, a bid submitted to a public agency by a contractor who is not licensed in accordance with this chapter shall be considered nonresponsive and shall be rejected by the public agency. Unless one of the foregoing exceptions applies, a local public agency shall, before awarding a contract or issuing a purchase order, verify that the contractor was properly licensed when the contractor submitted the bid. Notwithstanding any other provision of law, unless one of the foregoing exceptions applies, the registrar may issue a citation to any public officer or employee of a public entity who knowingly awards a contract or issues a purchase order to a contractor who is not licensed pursuant to this chapter. The amount of civil penalties, appeal, and finality of such citations shall be subject to Sections 7028.7 and 7028.13 inclusive of the California Business and Professions Code. Any contract awarded to, or any purchase order issued to, a contractor who is not licensed pursuant to this chapter is void.
- H. Any compliance or noncompliance with subdivision (G) of this paragraph shall not invalidate any contract or bid awarded by a public agency during which time that subdivision was in effect.
- I. A public employee or officer shall not be subject to a citation pursuant to this section if the public employee, officer, or employing agency made an inquiry to the board for the purposes of verifying the license status of any person or contractor and the board failed to respond to the inquiry within three business days. For the purposes of this section, a telephone response by the board shall be deemed sufficient.

17.16 DIGGING TRENCHES OR EXCAVATIONS; NOTICE ON DISCOVERY OF HAZARDOUS WASTE OR OTHER UNUSUAL CONDITIONS; INVESTIGATIONS; CHANGE ORDERS; EFFECT ON CONTRACT

- A. If this Contract involves digging trenches or other excavations that extend deeper than four feet below the surface, the following shall apply:
  - 1. The CONTRACTOR shall promptly, and before the following conditions are disturbed, notify the ENGINEER in writing, of any:
    - a. Material that the CONTRACTOR believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

- b. Subsurface or latent physical conditions at the site differing from those indicated.
- c. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract.
- d. The ENGINEER shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the CONTRACTOR'S cost of, or the time required for, performance of any part of the work shall issue a change order the procedures described in the Contract.
- e. In the event that a dispute arises between the ENGINEER and the CONTRACTOR whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the CONTRACTOR'S cost of, or time required for, performance of any part of the work, the CONTRACTOR shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all work to be performed under the Contract. The CONTRACTOR shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

#### 17.17 RETENTION PROCEEDS; WITHHOLDING; DISBURSEMENT

- A. In accordance with Section 7107 of the Public Contract Code with respects to all contracts entered into on or after January 1, 1993 relating to the construction of any public work of improvement the following shall apply:
  - 1. The retention proceeds withheld from any payment by the CITY from the original CONTRACTOR, or by the original CONTRACTOR from any subcontractor, shall be subject to this paragraph 17.18.
  - 2. Within 60 days after the date of completion of the WORK, including any punch-list WORK, the retention withheld by the CITY shall be released. In the event of a dispute between the ENGINEER and the original CONTRACTOR, the CITY may withhold from the final payment an amount not to exceed 150 percent of the disputed amount. For the purposes of this paragraph, "completion" means any of the following:
    - a. The occupation, beneficial use, and enjoyment of a work of improvement, excluding any operation only for testing, startup, or

commissioning, by the CITY, accompanied by cessation of labor on the work of improvement.

- b. The acceptance by the City Council of the work of improvement.
  - c. After the commencement of a work of improvement, a cessation of labor on the work of improvement for a continuous period of 100 days or more, due to factors beyond the control of the CONTRACTOR.
  - d. After the commencement of a work of improvement, a cessation of labor on the work of improvement for a continuous period of 30 days or more, if the ENGINEER files for record a notice of cessation or a notice of completion.
3. Subject to subparagraph 17.18 A.4, within 10 days from the time that all or any portion of the retention proceeds are received by the original CONTRACTOR, the original CONTRACTOR shall pay each of its subcontractors from whom retention has been withheld, each subcontractor's share of the retention received. However, if a retention payment received by the original CONTRACTOR is specifically designated for a particular subcontractor, payment of the retention shall be made to the designated subcontractor, if the payment is consistent with the terms of the subcontract.
  4. The original CONTRACTOR may withhold from a subcontractor its portion of the retention proceeds if a bona fide dispute exists between the subcontractor and the original CONTRACTOR. The amount withheld from the retention payment shall not exceed 150 percent of the estimated value of the disputed amount.
  5. In the event that retention payments are not made within the time periods required by this paragraph 17.18, the CITY or original CONTRACTOR shall be subject to a charge of 2 percent per month on the improperly withheld amount, in lieu of any interest otherwise due. Additionally, in any action for the collection of funds wrongfully withheld, the prevailing party shall be entitled to attorney's fees and costs.
  6. Any attempted waiver of the provisions of this section shall be void as against the public policy of this state.



#### 17.18 TIMELY PROGRESS PAYMENTS; INTEREST; PAYMENT REQUESTS

- A. If the CITY fails to make any progress payment within 30 days after receipt of an undisputed and properly submitted payment request from the CONTRACTOR, the CITY shall pay interest to the CONTRACTOR equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure.
- B. Upon receipt of a payment request, the ENGINEER shall act in accordance with both of the following:
  - 1. Each payment request shall be reviewed by the ENGINEER as soon as practicable after receipt for the purpose of determining that the payment request is a proper payment request.
  - 2. Any payment request determined not to be a proper payment request suitable for payment shall be returned to the CONTRACTOR as soon as practicable, but not later than seven days, after receipt. A request returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the payment request is not proper.
- C. The number of days available to the CITY to make a payment without incurring interest pursuant to this paragraph shall be reduced by the number of days by which the CITY exceeds the seven-day requirement set forth above.
- D. For purposes of this paragraph:
  - 1. A “progress payment” includes all payments due the CONTRACTOR, except that portion of the final payment designated by the contract as retention earnings.
  - 2. A payment request shall be considered properly executed if funds are available for payment of the payment request, and payments is not delayed due to an audit inquiry by the financial officer of the CITY.

#### 17.19 PREFERENCE FOR MATERIAL

- A. In accordance with Section 3400 of the California Public Contract Code, the CONTRACTOR will be provided a period prior to award of the contract for submission of data substantiating a request for a substitution of “as equal” item.

17.20 RESOLUTION OF CONSTRUCTION CLAIMS

- A. In accordance with Section 20104 et Seq. of the California Public Contract Code. This paragraph applies to all claims of \$375,000 or less which arise between the CONTRACTOR and the CITY under this Contract for:
1. A time extension;
  2. Payment of money or damages arising from work done by or on behalf of, the CONTRACTOR pursuant to this CONTRACT and payment of which is not otherwise expressly provided for or the CONTRACTOR is not otherwise entitled to; or
  3. An amount the payment of which is disputed by the ENGINEER.
- B. For any claim set out in Paragraphs A.1, 2, or 3 above, the following requirements apply:
1. The claim shall be in writing and include the documents necessary to substantiate the claim and be accompanied by the following certification:

“CONTRACT PROVISION REQUIRING PERSONAL CERTIFICATION OF ALL CLAIMS:

I, \_\_\_\_\_, BEING THE \_\_\_\_\_ (MUST BE AN OFFICER) OF \_\_\_\_\_ (GENERAL CONTRACTOR), DECLARE UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE STATE OF CALIFORNIA, AND DO PERSONALLY CERTIFY AND ATTEST THAT: I HAVE THOROUGHLY REVIEWED THE ATTACHED CLAIM FOR ADDITIONAL COMPENSATION AND/OR EXTENSION OF TIME, AND KNOW ITS CONTENTS, AND SAID CLAIM IS MADE IN GOOD FAITH; THE SUPPORTING DATA IS TRUTHFUL AND ACCURATE; THAT THE AMOUNT REQUESTED ACCURATELY REFLECTS THE CONTRACT ADJUSTMENT FOR WHICH THE CONTRACTOR BELIEVES THE CITY IS LIABLE; AND, FURTHER THAT I AM FAMILIAR WITH CALIFORNIA PENAL CODE SECTION 12650, ET SEQ. PERTAINING TO FALSE CLAIMS, AND FURTHER KNOW AND UNDERSTAND THAT SUBMISSION OR CERTIFICATION OF A FALSE CLAIM MAY LEAD TO FINES, IMPRISONMENT AND/OR OTHER SEVERE LEGAL CONSEQUENCES.”

Claims must be filed on or before the date of final payment. Nothing herein is intended to extend the time limit or supersede notice requirements otherwise provided by Contract for the filing of claims.

The claim must include an actual cost documentation, including hours of work performed, equipment operation costs, and labor and overhead costs, which should be established at a standard percentage. Any overhead costs listed when paid, shall provide full and complete payment for any and all overhead, including jobsite overhead, home office overhead, as well as additional costs arising from disruption, resequencing or acceleration. A notice of POTENTIAL CLAIM shall be submitted in advance of the performance of any work, regardless of type, in which the CONTRACTOR may claim an additional cost. CONTRACTOR shall provide prompt notification of any disagreement in quantities of work performed along with a detailed accounting by means of a schedule update demonstrating any delays incurred.

2. For claims of less than fifty thousand dollars (\$50,000), the ENGINEER shall respond in writing to any written claim within 45 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the CITY may have against the CONTRACTOR.

If additional information is thereafter required, it shall be requested and provided upon mutual agreement of the ENGINEER and the CONTRACTOR.

The ENGINEER's written response to the claim, as further documented, shall be submitted to the CONTRACTOR within 15 days after receipt of further documentation or within a period of time no greater than that taken by the CONTRACTOR in producing the additional information, whichever is greater.

3. For claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the ENGINEER shall respond in writing to all written claims within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the CITY may have against the CONTRACTOR.

If additional information is thereafter required, it shall be requested and provided upon mutual agreement of the ENGINEER and the CONTRACTOR.

The ENGINEER's written response to the claim, as further documented, shall be submitted to CONTRACTOR within 30 days after receipt of the further documentation, or within a period of time no greater than that taken by the CONTRACTOR in producing the additional information or requested documentation, whichever is greater.

4. If the CONTRACTOR disputes the ENGINEER's written response, or the ENGINEER fails to respond within the time prescribed, the CONTRACTOR may notify the ENGINEER, in writing, either within 15 days of receipt of the ENGINEER's response or within 15 days of the ENGINEER's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the ENGINEER shall schedule a meet and confer conference within 30 days for settlement of the dispute.
5. Following the meet and confer conference, if the claim or any portion remains in dispute, the CONTRACTOR may file a claim pursuant to Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time CONTRACTOR submits its written claim pursuant to subdivision (a) until the time the claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.

C. The following procedures are established for all civil actions filed to resolve claims subject to this article:

1. Within 60 days, but no earlier than 30 days, following the filing or responsive pleadings, the court shall submit the matter to nonbinding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.
2. If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act of 1986 (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3 of Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

Notwithstanding any other provision of law, upon stipulation of the parties, arbitrators appointed for purposes of Article 1.5 of Chapter 1 of Part 3 of Division 2 of the California Public Contract Code shall be experienced in construction law, and, upon stipulation of the parties, mediators and arbitrators shall be paid necessary and reasonable hourly rates of pay not to exceed their customary rate, and such fees and expenses shall be paid equally by the parties, except in the case of arbitration where the arbitrator, for good cause, determines a different division. In no event shall these fees or expenses be paid by state or county funds.

In addition to Chapter 2.5 (commencing with Section 1141.10 of Title 3 of Part 3 of the Code of Civil Procedure any party who after receiving an arbitration award requests a trial de novo but does not obtain a more favorable judgment shall, in addition to payment of costs and fees under that chapter, also pay the attorney's fees of the other party arising out of the trial de novo .

3. The CITY shall not fail to pay money as to any portion of a claim which is undisputed except as otherwise provided in this Contract.
4. In any suit filed under Section 20104.4 of the California Public Contract Code, the CITY shall pay interest at the legal rate on any arbitration award or judgment. The interest shall begin to accrue on the date the suit is filed in a court of law.

#### END OF GENERAL CONDITIONS

file name:

**SECTION III**  
**SPECIAL PROVISIONS**

## SECTION III.

### SPECIAL PROVISIONS

- 3-1. DESCRIPTION OF WORK – Soil lime treatment, installation of storm drain system (4" HDPE, 6" HDPE, 12" RCP, 12" HDPE, 18" HDPE and 24" HDPE, catch basin/inlet, cleanout, trench drain, 12" and 24" outfall), sanitary sewer lateral, water service lateral, AC paving, parking lot striping and signage, concrete curb and gutter, pedestrian concrete walkway, electrical lighting conduits, fencing, railing, bio-retention area, synthetic landscape turf system, irrigation system, planting trees, shrubs and sod, and wetlands mitigation.
- 3-2. ORDER OF PRECEDENCE OF CONTRACT DOCUMENTS – If the CONTRACTOR discovers any errors, omissions, discrepancies, or conflicts in the Contract, he/she shall immediately inform the ENGINEER in writing. The ENGINEER will promptly resolve such matters by issuing addenda or change orders. Failure or delay to act on the part of the ENGINEER shall not constitute a waiver of any right afforded the CITY or the ENGINEER by the Contract or marker prior to authorization by the CITY shall be at the CONTRACTOR'S risk.

Unless otherwise noted below, conflicts or inconsistencies between parts of the Contract will be resolved by the ENGINEER with a change order or an addendum, if required. Addenda and change orders bearing the most recent date shall prevail over addenda or change orders bearing earlier dates. Any reference to addenda-changed specifications or drawings shall be considered to have been changed accordingly.

In resolving conflicts, errors, or discrepancies, the order of precedence shall be as follows:

- 1) Change Orders/Addenda (most recent in time takes precedence)
- 2) Agreement and Bond Forms
- 3) Special Provisions
- 4) Technical Specifications
- 5) Standard Specifications (Current Caltrans Standard Specifications)
- 6) Drawings
- 7) General Conditions
- 8) Instructions to Bidders
- 9) CONTRACTOR'S Bid (Bid Form)
- 10) Notice Inviting Bids
- 11) Permits from other agencies as may be required by law.

- 3-3. COOPERATION - Attention is directed to Sections 5-1.20, "Coordination with Other Entities", and 5-1.36D, "Non-highway Facilities", of the Standard Specifications and these special provisions.

The CONTRACTOR shall not adjust gas, electric, television cable, telephone, and Sonoma County structures. The CONTRACTOR will notify each agency who will be in turn adjust their own structures at least seven (7) working days prior to covering/burying these facilities at no cost to the CITY. Failure to do so shall result in the CONTRACTOR being liable for the utility agencies' claims.

- 3-4. OBSTRUCTIONS - Attention is directed to Sections 5-1.36D, "Non-highway Facilities", and 15, "Existing Facilities", of the Standard Specifications and these special provisions.

The CONTRACTOR's attention is directed to the existence of certain underground facilities that may require special precautions be taken by the CONTRACTOR to protect the health, safety and welfare of workmen and of the public. Facilities requiring special precautions include, but are not limited to: conductors of petroleum products, oxygen, chlorine and toxic or flammable gases; natural gas in pipelines greater than 6 inches in diameter or pipelines operating at pressures greater than 60 psi (gage); underground electric supply system conductors or cables either directly buried or in duct or conduit which do not have concentric neutral conductors or other effectively grounded metal shields or sheaths; and underground electrical conductors with potential to ground of more than 300 volts.

The CONTRACTOR shall notify the ENGINEER and the appropriate regional notification center for operators of subsurface installations at least 5 working days prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Regional notification centers include but are not limited to the following:

Underground Service Alert  
Northern California (USA)  
Telephone: 1 (800) 227-2600

If the CONTRACTOR's certain operation is delayed, in the opinion of the ENGINEER, by the discovery of an underground utility not indicated on the plans or not marked by USA, the CONTRACTOR shall be paid a fair and reasonable compensation for the actual loss. Actual loss shall be understood to include no items of expense other than idle time of equipment exclusively used in such operation and necessary payments for idle time of labor exclusively required for such operation only, determined as follows:

- 1) Compensation for idle equipment shall be applied at the reduced Caltrans' Equipment Rental Rates where the right of way delay factor for each classification of equipment shall be applied to such equipment rental rate. No markup shall be applied for overhead or profit.
- 2) Compensation for idle time of labor shall be actual wages paid to the workers. No markup shall be added for overhead and profit.



- 3) The time for which such compensation will be paid will not exceed eight (8) hours for each incident.
- 4) The CONTRACTOR shall be granted an extension of time for the delay.
- 5) No monetary compensation will be allowed for delays due to utilities indicated on the plans or marked by USA.

3-5. MAINTAINING TRAFFIC – Attention is directed to Sections 7-1.03, “Public Convenience”, 7-1.04, “Public Safety”, and 12, “Temporary Traffic Control”, of the Standard Specifications and the City of Petaluma Traffic Control Design and Construction Standards Series 700. Nothing in these special provisions shall be construed as relieving the CONTRACTOR from his/her responsibility as provided in said Section 7-1.04. The CONTRACTOR shall not obstruct parking in front of the soccer fields without prior City approval.

The Contractor will minimize disruption to all traffic (vehicular, transit, bicycle, and pedestrians) during the allowed work window. During construction, bicyclists will either share the road with vehicular traffic in a signed detour or be provided separate access. In addition, pedestrian access will be maintained at all times during construction. The Contractor shall provide temporary pedestrian curb ramps and clearly mark the temporary crosswalks. The pedestrian path shall be clear of any debris and meet ADA requirements. Driveway access to schools, residents, and businesses will also be maintained at all times.

Lane closures shall conform to the provisions in the section of these special provisions entitled, “Traffic Control System for Lane Closure”.

At least five (5) working days prior to beginning of each phase of construction (i.e., piping installation, paving, pavement repair, concrete construction, etc.), the CONTRACTOR shall:

- A. Notify all adjacent residents, businesses, City of Petaluma Police and Fire, Green Waste Recovery (residential refuse service company), Waste Management Company (industrial refuse service company), and Petaluma Transit by written notices detailing the type, limits, date and the hours of work. Details of the notice shall be submitted to the ENGINEER for review and approval at least five (5) days prior to delivering these notices.
- B. Where required, post streets with temporary "No Parking/Tow Away" signs at 100-foot intervals at least 72 hours in advance. These signs shall be furnished by the CONTRACTOR and shall state the date; day of week and hour parking is prohibited.

Illuminated traffic cones when used during the hours of darkness shall be affixed or covered with reflective cone sleeves as specified in Section 12-3.10, "Traffic Cones", of the Standard Specifications.

Full compensation for temporary delineation shall be considered as included in the prices paid for the contract in terms of work which obliterated the existing delineation and no separate payment will be made therefore.

When working in or blocking any intersection, the CONTRACTOR shall provide flag persons to direct traffic at that intersection. This is in addition to other required flag persons.

Personal vehicles of the CONTRACTOR's employees shall not be parked on the traveled way, including any section closed to public traffic. The CONTRACTOR, at all times, shall provide flag person(s) to direct delivery trucks and CONTRACTOR's vehicles entering or leaving the public traffic.

The CONTRACTOR shall notify the City of Petaluma of his/her intent to begin work at least 5 days before work is begun. The CONTRACTOR shall cooperate with local authorities relative to handling traffic through the area and shall make his/her own arrangements relative to keeping the working area clear of parked vehicles.

Whenever vehicles or equipment are parked on the shoulder within 6 feet of a traffic lane, the shoulder area shall be closed with fluorescent traffic cones or portable delineators placed on a taper in advance of the parked vehicles or equipment and along the edge of the pavement at 25-foot intervals to a point not less than 25 feet past the last vehicle or piece of equipment. A minimum of 9 cones or portable delineators shall be used for the taper. A C23 (Road Work Ahead) or C24 (Shoulder Work Ahead) sign shall be mounted on a telescoping flag tree with flags. The flag tree shall be placed where directed by the ENGINEER.

A minimum of one (paved) reversible traffic lane, not less than 10 feet wide, shall be open for use by public traffic in with minimal delays, flaggers, adequate traffic control, and signing. ***Flashing arrow boards shall be required for any lane closures.***

Day work: No work and/or preparation of work shall be performed between 5:00 p.m. and 7:00 a.m. unless approved by the ENGINEER in writing, except work required under said Sections 7-1.03 and 7-1.04 of the Standard Specifications or specified elsewhere in the special provisions.

Night work: No work and/or preparation of work shall be performed between 5:00 a.m. and 10:00 p.m. unless approved by the ENGINEER in writing, except work required under said Sections 7-1.03 and 7-1.04 of the Standard Specifications or specified elsewhere in the special provisions.

Except as otherwise provided, the full width of the traveled way shall be open for use by public traffic on Saturdays, Sundays, after 4:00 p.m. on Fridays, on designated legal holidays, during the holiday shutdown period (in applicable areas), and when construction operations are not actively in progress.

Designated legal holidays and the holiday shutdown period are outlined in “Hours of Work” of these Special Provisions.

Minor deviations from the requirements of this section concerning hours of work which do not significantly change the cost of the work may be permitted upon the written request of the CONTRACTOR if in the opinion of the ENGINEER public traffic will be better served and the work expedited. Such deviations shall not be adopted until the ENGINEER has indicated his/her written approval. All other modifications will be made by contract change order.

The City of Petaluma Traffic Control Design and Construction Standards (Series 700) shown elsewhere in these specifications are guidelines only. The CONTRACTOR is not relieved from his/her responsibility for submitting his/her own traffic control plan.

**The CONTRACTOR's failure to comply with the requirements of this section will be sufficient cause for the ENGINEER to suspend work at no cost to the City.**

All costs involved for completing all work described in this section shall be considered to be included in the contract price paid for Traffic Control System and no additional compensation shall be allowed therefore.

CONTRACTOR shall maintain public access along the trail for safe public access.

3-6. WATERING - Watering shall conform to the provisions in Section 17, "Watering", of the Standard Specifications except that full compensation for developing water supply shall be considered as included in the prices paid for various contract items for work involving the use of water and no separate payment will be made therefore. The application of water for dust control will not be considered as extra work under any circumstances. Water can be purchased from the City at current rates provided that the CONTRACTOR meters the water so used with a City furnished meter (a deposit will be required) and a CONTRACTOR furnished valve assembly.

3-7. PROGRESS SCHEDULE - The CONTRACTOR shall submit a schedule which includes all major tasks and milestones to the City of Petaluma, Public Works and Utilities Department for review **at least** ten (10) working days prior to start of work.

After beginning of work, updated schedules shall be submitted. No progress payments will be processed without accepted updated schedules.

Payment for the original schedule and updated, weekly schedules shall be considered to be included in the various items of work and no additional compensation will be allowed therefore.

3-8. SUPERINTENDENCE - The CONTRACTOR shall designate in writing and submit to the Project Engineer two (2) working days before starting work, an authorized representative who shall have the authority to represent and act for the CONTRACTOR for the duration of the contract. Any change in the designation shall require prior approval of the ENGINEER.

When the CONTRACTOR is comprised of two (2) or more persons, firms, partnerships or corporations functioning on a joint venture basis, said CONTRACTOR shall designate in writing before starting work, the name of one authorized representative who shall have the authority to represent and act for the CONTRACTOR.

Said authorized representative shall be present at the site of work at all times while work is actually in progress on the contract. When work is not in progress and during periods when work is suspended, arrangements acceptable to the ENGINEER shall be made for any emergency work, which may be required.

If work is in progress and the authorized representative is not on site, the City reserves the right to stop the work at no cost to the City.

Once the work begins, the Superintendent shall keep the ENGINEER informed of the CONTRACTOR's daily schedule. The ENGINEER shall have at least twenty-four (24) hour advance notice of all work, on a daily basis, including SUBCONTRACTOR's work. If the CONTRACTOR fails to notify the ENGINEER, the ENGINEER reserves the right to stop the work at no cost to the City.

In the case of urgency or emergency where the CONTRACTOR's authorized representative is not present on any particular part of the work and where the ENGINEER wishes to give notification or direction, it will be given to and be obeyed by the superintendent or foreperson who may have charge of the particular work or it will be given to and be obeyed by any worker in the area should the superintendent or foreperson not be immediately available.

All costs involved in superintendence shall be included in the contract prices paid for various items of work and no additional payment will be allowed therefore.

- 3-9. SAFETY REQUIREMENT - The CONTRACTOR shall comply with all CAL/OSHA safety requirements. It shall be the CONTRACTOR's sole responsibility for making sure these safety requirements are met and the CONTRACTOR shall fully assume all liabilities for any damages and/or injuries resulting from his or her failure to comply with the safety requirements. Failure on the City's part to stop unsafe practices shall, in no way, relieve the CONTRACTOR of his/her responsibility.

The CONTRACTOR shall first call City of Petaluma Emergency Center at 911, from a regular telephone, and (707) 762-2727 or from a cellular phone (707) 762-4545, if any gas lines or electrical power lines are broken or damaged.

- 3-10. PROJECT AND CONSTRUCTION AREA SIGNS – Project sign and construction area signs shall be furnished, installed, maintained, and removed when no longer required in accordance with the provisions in Section 12, “Construction Area Traffic Control Devices”, of the Standard Specifications.

Two (2) project signs with a minimum dimension of 3’X4’X3/4” plywood bolted to an A-frame barricade shall be furnished, installed and moved from site to site by the

Contractor. Letters and numbers shall be black on a white background. The sign information shall be as shown below:

**CITY OF PETALUMA (4" LETTERS)**

**PROJECT: PETALUMA COMMUNITY SPORTS FIELDS  
BASEBALL DIAMOND PROJECT**

**FUNDING: PARKLAND IMPACT FUNDS  
& DONATIONS (3" LETTERS)**

**PROJECT MANAGER: KEN EICHSTAEDT (3" LETTERS)**

**PHONE: 707-210-2266**

The signs shall be approved prior to fabrication and posted as directed by the Engineer.

Construction area signs will be installed prior to start of construction and maintained in place for the duration of the project by the CONTRACTOR. When installed, the signs shall not extend beyond the street curb alignment into the travel way. Signs shall be repaired or replaced at no cost to the City of Petaluma, if damaged or stolen. The CONTRACTOR shall remove the signs and posts at the completion of the project and with prior approval of the ENGINEER.

All costs involved in purchasing and installing construction area and project signs shall be considered as included in the Lump Sum price paid for Traffic Control System.

- 3-11. PROJECT APPEARANCE – The CONTRACTOR shall maintain a neat appearance to the work area.

When practicable, debris developed during construction shall be disposed of concurrently with its removal. It is anticipated that all material excavated on the site can remain on the site as directed by the CITY. Stockpiling on the street shall not be allowed. The CONTRACTOR shall apply for a "stockpiling" permit from the City's Community Development Department prior to stockpiling more than fifty (50) cubic yards of materials on private property. The CONTRACTOR shall solely be responsible for securing staging and/or stockpiling areas.

The CONTRACTOR shall provide dust control as often as required during the construction, and shall clean the roads/streets with street sweepers at least once a day at the end of each working day or more often if safety or appearance conditions warrant. Failure to maintain dust control, street cleaning and/or any required work specified in this section shall result in the City performing the work with other forces and back charge the CONTRACTOR for the costs.

Full compensation for conforming to the provisions in this section, not otherwise provided for, shall be considered as included in prices paid for the various contract items of work involved and no additional compensation will be allowed therefore.

- 3-12. RESPONSIBILITY FOR DAMAGE - The CONTRACTOR shall indemnify, hold harmless, release and defend the City of Petaluma, its officers, officials, employees and agents from and against any and all liabilities, claims, demands, losses, damages, expenses, costs (including without limitation costs and fees of litigation) of every nature arising out of or in connection with the activities of the CONTRACTOR, his/her subcontractors, employees and agents, except such loss or damage which was caused by the sole negligence or willful misconduct of the CITY, its employees or agents. The CITY may retain so much of the money due the CONTRACTOR as shall be considered necessary, until disposition has been made of claims or suits for damages as aforesaid.
- 3-13. GUARANTEE OF WORK - Neither the final certificate of payment nor any provision in the contract nor partial or entire use of the improvements embraced in this contract by the City or the public shall constitute an acceptance of work not done in accordance with the contract or relieve the CONTRACTOR of liability in respect to any warranties or responsibility for faulty materials or workmanship. The CONTRACTOR's attention is directed to Article 5, "Bonds and Insurance", of the General Conditions.
- 3-14. NOTICE TO PROCEED, BEGINNING OF WORK, CONTRACT TIME, TIME OF COMPLETION, AND LIQUIDATED DAMAGES – Article 2.3, "Commencement of Contract Times; Notice To Proceed" of the General Conditions is amended to read:

The CONTRACTOR shall begin work within ten (10) working days from the date of Notice To Proceed (NTP) and shall diligently prosecute the same to completion before the expiration of total allocated working days as specified in the Construction Agreement and/or Invitation to Bid, from the date of starting work. The CONTRACTOR shall complete all of the work directed by the ENGINEER in all parts and requirements within the time set forth. A working day is defined in these specifications.

The CONTRACTOR is on notice that it may take approximately eight (8) weeks from the bid opening to obtain the City Council's award of the contract, to process the construction agreement, and to issue the Notice to Proceed.

**The CONTRACTOR shall pay to the City of Petaluma the sum of \$100 per day for each and every *calendar day's* delay in finishing the work in excess of the number of days prescribed above (and/or in excess of the number of days prescribed for any scheduled operations or works described in the Special Provisions).**

A working day is defined as any day, except as follows:

- a. Saturdays, Sundays, and legal holidays
- b. Days on which the CONTRACTOR is prevented by inclement weather or conditions resulting immediately therefrom adverse to the current controlling operation or operations, as determined by the ENGINEER, from proceeding with at least 75 percent of the normal labor and equipment force engaged on that operation or operations for at least 60 percent of the total daily time being currently spent on the controlling operation or operations.

Should the CONTRACTOR prepare to begin work at the regular starting time of any day on which inclement weather, or the conditions resulting from the weather, or the condition of the work, prevents the work from beginning at the usual starting time and the crew is dismissed as a result thereof and the CONTRACTOR does not proceed with at least 75 percent of the normal labor and equipment force engaged in the current controlling operation or operations for at least 60 percent of the total daily time being currently spent on the controlling operation or operations, the CONTRACTOR will not be charged for a working day whether or not conditions should change thereafter during that day and the major portion of the day could be considered to be suitable for those construction operations.

Determination that a day is a non-working day by reason of inclement weather or conditions resulting immediately therefrom shall be made by the ENGINEER. The CONTRACTOR will be allowed 10 days from the issuance of the weekly statement of working days in which to file a written protest setting forth in what respects the CONTRACTOR differs from the ENGINEER; otherwise, the decision of the ENGINEER shall be deemed to have been accepted by the CONTRACTOR as correct. The ENGINEER will furnish the CONTRACTOR a weekly statement showing the number of working days charged to the contract for the preceding week, the number of working days of time extensions being considered or approved, the number of working days originally specified for the completion of the contract, and the number of working days remaining to complete the contract and any time extensions thereof.

### 3-15. HOURS OF WORK

Weekdays – Weekdays (Monday through Friday) hours shall be from 7:00 a.m. to 5:00 p.m. for all required work except those hours approved by the City of Petaluma or specified in “Order of Work” Section of these special provisions. Work hours for County of Sonoma and Caltrans right of way shall be governed by their respective permit conditions.

Night Hours – Other than emergency work, there will be no night hours allowed on this project.

Liquidated Damages in the sum of Fifteen Hundred Dollars (\$1,500) per day will be assessed against the CONTRACTOR if he fails to comply with any of the daily conditions or operations such as maintaining erosion control facilities, job site/street cleanliness and daily cleanup and traffic control and flagging, as described in the General Conditions, these Special Provisions, and the Technical Specifications.

If the CONTRACTOR closes a street or sidewalk without prior notice and approval of the ENGINEER within 24 hours, the associated operation will be shutdown at the CONTRACTOR’s expense.

Holidays - Designated legal holidays are: January 1st, the third Monday in January, the third Monday in February, the last Monday in May, July 4th, the first Monday in September, the second Monday in October, November 11th, Thanksgiving Day, the day after Thanksgiving, December 24th and December 25th. When a designated legal

holiday falls on a Sunday, the following Monday shall be a designated legal holiday. When November 11th falls on a Saturday, the preceding Friday shall be a designated legal holiday. The Contractor shall not work on the legal holidays unless approved in writing by the Engineer.

Holiday Shutdown - No work shall be allowed to be performed in the business district (defined by the map on the City of Petaluma web site at <http://cityofpetaluma.net/cdd/pdf/boundaries.pdf>) between Thanksgiving Day, the day after Thanksgiving, and December 25<sup>th</sup> thru January 3<sup>rd</sup> of the following year.

- 3-16. RECORD ("AS-BUILT") DRAWINGS – The CONTRACTOR shall furnish Record Drawings of the complete project and procure from the Director of Public Works a full sized set of Contract Drawings. Construction drawings shall be on the construction site at all times while the work is in progress. Drawings shall show approved substitutions, if any, of material including manufacturer's name and catalog number. The Drawings shall be to scale and all indications shall be neat and legible. All information noted on the CONTRACTOR's job-site print shall be transferred to the Record Drawings by CONTRACTOR and all indications shall be recorded in a neat, legible and orderly way. The Record Drawings shall be signed by the CONTRACTOR and turned over to the Director of Public Works before the final acceptance of the project. If the CONTRACTOR fails to provide the City with an acceptable "Record Drawings", the City shall deduct \$2,000 from the amount due CONTRACTOR.
- 3-17. NOTICE OF POTENTIAL CLAIM - If for any reason the CONTRACTOR deems that additional compensation is due him/her for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized extra work, a Notice of Potential Claim shall be made. The CONTRACTOR shall give the ENGINEER a written Notice of Potential Claim for such additional compensation before work begins on the items on which the claim is based. The notice shall set forth the reasons for which the CONTRACTOR believes additional compensation will or may be due and the nature of the costs involved. The CONTRACTOR shall afford the ENGINEER every opportunity and facility for keeping records of the actual cost of the work. The CONTRACTOR shall keep records of the disputed work in accordance with Contract General Conditions, Section 11.3, "Cost of Work (Based on Time and Materials)."

If such notification is not given or the ENGINEER is not afforded proper opportunity by the CONTRACTOR for keeping strict account of actual cost as required, then the CONTRACTOR hereby agrees to waive any claim for such additional compensation. Such notice by the CONTRACTOR and the fact that the ENGINEER has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the CONTRACTOR shall, within 10 calendar days, submit his/her written claim to the ENGINEER who will present it to the City for consideration in accordance with local laws or ordinances. The CONTRACTOR is directed to Section 17.20 "Resolution of Construction Claims" of the General Conditions.

Any claim for overhead type expenses or costs, in addition to being certified as stated above, shall be supported by an audit report of an independent Certified Public



Accountant. Any claim for overhead shall also be subject to audit by the City at its discretion.

Any costs or expenses incurred by the City in reviewing or auditing any claims that are not supported by the CONTRACTOR's cost accounting or other records shall be deemed to be damages incurred by the City within the meaning of the California False Claims Act.

Nothing in this subsection shall be construed as a waiver of the CONTRACTOR's right to dispute final payment based on differences in in-place quantity measurements or computations of unit priced pay items.

3-18. PAYMENT FOR MATERIALS ON HAND - At the discretion of the ENGINEER, partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications. Such delivered costs of stored or stockpile materials may be included in the next partial payment after the following conditions are met:

1. The material has been stored or stockpiled and protected at the sole expense of the CONTRACTOR at a location acceptable to the City and in a manner acceptable to the ENGINEER.
2. The CONTRACTOR has furnished the ENGINEER with acceptable evidence of the quantity and quality of such stored or stockpiled materials.
3. The CONTRACTOR has furnished the ENGINEER with satisfactory evidence that the material and transportation costs have been paid.
4. The CONTRACTOR has furnished the City legal title (free of liens or encumbrances of any kind) to the material so stored or stockpiled.
5. The CONTRACTOR has furnished the City evidence that the material so stored or stockpiled is insured against loss by damage to or disappearance of such materials at anytime prior to use in the work.
6. The CONTRACTOR shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this subsection.

It is understood and agreed that the transfer of title and the City's payment for such stored or stockpiled materials shall in no way relieve the CONTRACTOR of his/her responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications. In no case will the amount of partial payments for materials on hand exceed 70% of the contract price for the contract items in which the material is intended to be used.

3-19. ACCESS TO DRIVEWAYS – All accesses for the sports fields, local businesses and residents shall be maintained at all times. Temporary ramps will be required each night

for access to driveways for residences and commercial access. The Contractor shall coordinate with each driveway user as needed.

- 3-20. ARCHAEOLOGICAL MONITORING – In the event that archaeological materials are found during construction, CONTRACTOR shall notify the ENGINEER immediately and shall temporarily cease work in the area until a determination or investigation of the site can be made by a qualified archaeologist. Archaeologist services shall be provided by the City at no cost to the CONTRACTOR.
- 3-21. BIOLOGICAL MONITORING – The CITY will be providing biological monitoring as deemed necessary. The CONTRACTOR shall notify the ENGINEER immediately for any biological disturbance.
- 3-22. STORM WATER MANAGEMENT, AND SEDIMENT AND EROSION CONTROL – CONTRACTOR shall prepare storm water management, and sediment and erosion control measures for implementation and shall maintain these measures during the construction period as required by the Regional Water Quality Control Board (RWQCB) permit.

If the area to be disturbed by construction activities is more than one acre, the CONTRACTOR shall be required to file a Notice of Intention (NOI), pay the fee, prepare the SWPPP, BMP, etc. as required by RWQCB permit.

Storm water management, and sediment and erosion control shall include, but not be limited to fiber rolls (sediment logs or wattles), straw bales, drain rock, check dams, silt fencing, siltation basins and as required for construction conditions. Measures shall be submitted to the ENGINEER for review seven (7) days prior to start of construction. The CONTRACTOR shall be responsible for providing the measures that would comply with the RWQCB.

The CONTRACTOR shall also place drain rock bags around storm drain inlets/catch basins, and install drain rock check dams at 50-foot intervals within 100 feet upstream from the inlets/catch basins.

The CONTRACTOR shall comply with all Federal, State and local regulations and ordinances governing storm water pollution prevention.

If required, the CONTRACTOR shall file a Notice of Intent (NOI) with the RWQCB, and shall comply with the National Pollution Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Association with Construction Activity requirements. The CONTRACTOR shall prepare and implement a Storm Water Pollution Plan (SWPPP). Resources used in developing the SWPPP shall include the “California Storm Water Best Management Practice Handbook for Construction Activity,” and the San Francisco Bay Regional Water Quality Control Board’s “Information on Erosion and Sediment Controls for Construction Projects.” The SWPPP shall be submitted for review and acceptance prior to start of work. The CONTRACTOR shall have an accepted and implemented SWPPP as part of Mobilization. The SWPPP

shall, at a minimum, include Best Management Practices (BMPs), acceptable to the City, to address the following:

1. Housekeeping
2. Waste Containment and Control.
3. Minimizing Disturbed Areas.
4. Stabilize Disturbed Areas.
5. Protect Slopes and Channels.
6. Control Site Perimeter.
7. Control of Internal Erosion.
8. Disposal of Storm Water and Ground Water
9. Sediment Control.
10. Liquid Waste Management.
11. Concrete Waste Management.
12. Hazardous Waste Management.
13. Employee and SUBCONTRACTOR Training.
14. Vehicle and Equipment Fueling and Maintenance.
15. Spill Prevention and Control.
16. Contaminated Soil Management.
17. Sawcutting.
18. Paving and Asphalt Work.
19. Street Cleaning.
20. Dust Control

In the construction of concrete pathway, employ and utilize the required best management practices such as installation of temporary silt fence, and catch basin protection, and fully observe all local, state, and federal regulations.

All costs involved for completing all work described in this section shall be considered to be included in the contract price paid under Clearing and Grubbing and Earthwork, and no additional compensation shall be allowed therefore.

3-23. ITEM INCREASES AND DECREASES -

**Increased or Decreased Quantities**

Increases or decreases in the quantity of a contract item of work will be determined by comparing the total pay quantity of that item of work with the ENGINEER's Estimate therefor.

If the total pay quantity of any item of work required under the contract varies from the ENGINEER's Estimate therefore by 25 percent or less for increases and 25 percent or less for decreases, payment will be made for the quantity of work of the item performed at the contract unit price.

If the total pay quantity of any item of work required under the contract varies from the ENGINEER's Estimate therefor by more than 25 percent for increases and 25 percent for decreases, in the absence of an executed contract change order specifying the compensation to be paid, the compensation payable to the CONTRACTOR will be determined in accordance with the following sections.

**Increases of More Than 25 Percent**

Should the total pay quantity of any item of work required under the contract exceed the ENGINEER's Estimate therefore by more than 25 percent, the work in excess of 125 percent of the estimate and not covered by an executed contract change order specifying the compensation to be paid therefor will be paid for by adjusting the contract unit price based upon a force account analysis.

The adjustment of the contract unit price will be the difference between the contract unit price and the actual unit cost which will be determined as hereinafter provided, of the total pay quantity of the item. If the costs applicable to the item of work include fixed costs, the fixed costs will be deemed to have been recovered by the CONTRACTOR by the payments made for 125 percent of the ENGINEER's Estimate of the quantity for the item, and in computing the actual unit cost, the fixed costs will be excluded. Subject to the above provisions, the actual unit cost will be determined by the ENGINEER in the same manner as if the work were to be paid for on a force account basis.

When the compensation payable for the number of units of an item of work performed in excess of 125 percent of the ENGINEER's Estimate is less than \$5,000 at the applicable contract unit price, the ENGINEER reserves the right to make no adjustment in the contract unit price if the ENGINEER so elects, except that an adjustment will be made if requested in writing by the CONTRACTOR.

**Decreases of More Than 25 Percent**

Should the total pay quantity of any item of work required under the contract be less than 25 percent of the ENGINEER's Estimate therefore, an adjustment in compensation pursuant to this Section will not be made unless the CONTRACTOR so requests in writing. If the CONTRACTOR so requests, the quantity of the item performed, unless covered by an executed contract change order specifying the compensation payable therefor, will be paid for by adjusting the contract unit price based upon a force account analysis. In no case shall the payment for that work be less than that which would be made at the contract unit price.

The adjustment of the contract unit price will be the difference between the contract unit price and the actual unit cost, which will be determined as hereinafter provided, of the total pay quantity of the item, including fixed costs. The actual unit cost will be determined by the ENGINEER in the same manner as if the work were to be paid for on a force account basis; or the adjustment will be as agreed to by the CONTRACTOR and the ENGINEER.

The payment for the total pay quantity of the item of work will in no case exceed the payment which would be made for the performance of 25 percent of the ENGINEER's Estimate of the quantity for the item at the original contract unit price.

- 3-24. EXISTING WATER VALVES, MONUMENTS AND MANHOLES – The City shall have access at all times to water valves, monuments, and manholes except immediately following a construction operation as noted below.

Prior to placement of paving, all manholes, monuments, and valves covered by paving, shall be clearly marked in white paint before the close of that work day. Throughout the construction process, the CITY shall have access to manholes, monuments, and valves within 48 hours of any operation affecting the manholes, monuments and valves.

**A penalty of Fifty Dollars (\$50) per each valve, monument, and manhole that is not raised, or that the CITY is not provided easy access to, will be assessed against the contractor for each calendar day.**

- 3-25. WAGE RATES - The General Prevailing Wage Determination Made by the Director of Industrial Relations Pursuant to California Labor Code Part 7, Chapter 1, Article 2, Sections 1770, 1773 and 1773.2. The CONTRACTOR can download this information from the web site: <http://www.dir.ca.gov/dlsr/PWD/>

The most current prevailing wage rates available at the time of bid opening shall be used.

- 3-26. STAGING AREA – It is the responsibility of the Contractor to provide a staging area for equipment and materials. The site and hauling route shall be submitted to the City for approval prior to the commencement of work. The Contractor shall obtain written confirmation from property owners for use of the site.

- 3-27. COORDINATION WITH PG&E – CONTRACTOR shall coordinate the work schedule with PG&E and the City of Petaluma 2 weeks prior to commencement of work. Delays claims or request for additional compensation will not permitted due to PG&E operations

or for time waiting on PG&E to determined abandoned facilities or PG&E encounters. All coordination, down time, and work associated with the PG&E shall be considered as included in other items of work and shall be included in prices paid for various contract items of work involved and no additional compensation will be allowed therefor.

**SECTION IV**  
**TECHNICAL SPECIFICATIONS**

## SECTION 02 0001

### SITE CONDITIONS

#### PART 1 GENERAL

##### 1.1 INFORMATION ON SITE CONDITIONS

- A. Information obtained by the Engineer regarding site conditions, surface topography, subsurface information, existing construction of site facilities, and existing underground utilities and similar data are shown on the plans.
- B. Geotechnical Design Recommendations – East Washington Park – Phase 2, prepared by Miller Pacific Engineering Group, dated January 10, 2020 has been prepared for the project and is included in the Appendix.
- C. Investigations conducted by a Geotechnical Engineer of subsurface conditions were made for the purpose of study and design, and neither the Engineer nor the Owner assume any responsibility in respect to the sufficiency or accuracy of the test pits, or of other investigations that have been made, or of the interpretations made thereof, and there is no warranty or guarantee, either expressed or implied, that the conditions indicated by such investigations are representative of those existing throughout such area, or any part thereof, or that unforeseen for developments may not occur.
- D. Logs of test borings, pits, geotechnical reports, or topographic maps showing a record of the data obtained by the Engineer's investigations of surface and subsurface conditions that are made available, shown on the plans, or bound herewith shall not be considered a part of the Contract Documents, said logs representing only the opinion of the Engineer as to the character of the materials encountered by him in his investigations and are provided only for the convenience of the Bidders.
- E. Information derived from inspection of logs of test borings, pits, topographic maps, geotechnical reports, or from Plans showing locations of utilities and structures will not relieve the Contractor from risk or from properly examining the site and making such additional investigations, or from properly fulfilling the terms of the Contract Documents.

##### CONTRACTOR'S RESPONSIBILITIES

- F. The Contractor shall satisfy himself as to the nature and location of the Work, the general and local conditions, particularly those bearing upon availability of transportation, disposal, limited access to site, handling and storage of materials, availability of labor, water, electric power, roads, and uncertainties of weather, river stages, or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment facilities needed preliminary to and during the prosecution of the Work and other matters which affect the Work or the cost thereof under this Contract.
- G. The Contractor shall further satisfy himself as to the character, quality, and quantity of surface and subsurface materials to be encountered during the course of execution of the work by inspecting the site as well as, any exploratory work performed by the Engineer, and information presented by the Plans and Specifications made a part of this Contract. Failure by the Contractor to acquaint himself with all available information will not relieve him from



responsibility for properly estimating the difficulty or cost of successfully performing the Work.

- H. Anticipate underground obstructions such as utility lines, concrete, water table, soil conditions and debris. No extra payment will be allowed for the removal, replacement, repair or possible increased cost caused by underground obstructions. Such lines or obstructions indicated on the map show the approximate location and must be verified in the field by the Contractor. The Engineer will endeavor to familiarize the Contractor with known underground obstructions, but this will not relieve the Contractor from full responsibility in anticipating and locating underground obstructions.
- I. The Contractor shall note that some of the existing roads and streets are residential in character and that heavy truck and equipment operations may cause roadway damage in excess of normal usage. Damage caused to the streets, curbs, gutters, or bike path by the Contractor's operations shall be repaired to a condition equal or better than the original condition at the Contractor's expense.
- J. Overhead electrical lines are within the limits of work. Verify locations prior to construction.

## **1.2 ADDITIONAL INFORMATION**

- A. Prior to bidding, Bidders may make their own subsurface investigations subject to time schedules and arrangements approved in advance by the Owner. Before any subsurface test holes are excavated, obtain permits from the Owner, City and/or County to perform such work.

## **1.3 SURFACE FACILITIES**

- A. Plans were prepared based on available information and, therefore, existing surface facilities may not be shown on the Plans. It is the Contractor's responsibility to acquaint himself with existing site conditions per this Section and anticipate those surface facilities which are typically encountered (fences, signs, mailboxes, sidewalks, driveways, ditches, AC pavement, AC dikes, curbing, power poles, overhead lines, landscaping, irrigation, etc.) and will affect the work. Provide adequate security to protect the public and Work. No extra payment will be made to the Contractor for the repair, removal and replacement of such facilities. Full payment for this work shall be as included in the various bid items.

## **PART 2 PRODUCTS-NOT USED**

## **PART 3 EXECUTION-NOT USED**

**END OF SECTION**

**SECTION 02 0003**

**EXISTING UTILITIES AND UNDERGROUND  
STRUCTURES**

**PART 1 GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Refer to plans for the locations of utilities and underground structures.
  - 2. Contractor's responsibilities.

**1.2 CALIFORNIA ADMINISTRATIVE CODE**

- A. Section 1540(a)l of Construction Safety Orders (Title 8) California Administrative Code, section 1540 states:
  - (1) "Prior to opening and excavation, effort shall be made to determine whether underground installations; i.e., sewer, water, gas, electric lines, storm drain, cable TV, telephone, and fiber optics, will be encountered and, if so, where such underground installations are located. When the excavation approaches the approximate location of such an installation, the exact location shall be determined by careful probing or hand digging; and, when it is uncovered, adequate protection shall be provided for the existing installation. All known owners of underground facilities in the area concerned shall be advised of proposed work at least 48 hours prior to the start of actual excavation."
- B. The Engineer has estimated the approximate location of public utilities and underground structures based on information provided by the utility owners. However, in accordance with California's Administrative Code, section 1540, Contractor shall make the effort to determine the exact location of underground installations.

**1.3 PUBLIC UTILITIES AFFECTED**

- A. Electrical: Pacific Gas & Electric Company. It should be noted that where overhead service does not exist, to a structure known to receive service, then underground service shall be assumed to exist. For underground utility location call USA North at 811 at least three working days in advance.
- B. Natural Gas: Pacific Gas & Electric Company has jurisdiction over natural gas lines. For underground utility location call USA North at 811 at least two working days in advance.
- C. Water Service: City of Petaluma has jurisdiction over water usage. City of Petaluma has water transmission mains in the vicinity. For underground utility location call USA North at 811 at least two working days in advance.
- D. Drainage: The City of Petaluma has jurisdiction over drainage in the area.

- E. Roads: The City of Petaluma and the County of Sonoma have jurisdiction over roads in the area. Contractor shall obtain an encroachment permit for all work within right-of-way.
- F. Cable Television: Comcast - It should be noted that where overhead service does not exist, to a structure known to receive service, then underground service shall be assumed to exist. For underground utility location, call USA North at 811 at least two working days in advance.
- G. Telephone: AT&T - It should be noted that where overhead service does not exist, to a structure known to receive service, then underground service shall be assumed to exist. For assistance with location of underground telephone facilities, call USA North at 811 at least two working days in advance.
- H. Traffic Signals: City of Petaluma has jurisdiction over traffic signal conduit/conductors and street lights.

#### **1.4 SUBMITTALS**

- A. Provide submittals in accordance with the General Conditions and Special Provisions.
- B. Shop Drawings: Submit plans and calculations for supporting existing utilities across trench prior to pipeline submittal. Calculations shall be certified by the Contractor's engineer.

### **PART 2 PRODUCTS-NOT USED**

### **PART 3 EXECUTION**

#### **3.1 CONTRACTOR RESPONSIBILITY**

- A. Anticipate utilities including but not limited to water, sewer, storm drain, electrical, gas, cable TV, and telephone services. There may be variation in location from that as shown on the Plans to the actual location. Actual location can best be determined in the field after pre-marking by the various utilities affected.
- B. Various utilities are indicated on the Plans to show only the approximate location and must be verified in the field by the Contractor. Although the various utility agencies may cooperate with the Contractor to endeavor to familiarize him with known underground utility obstructions, this will not relieve the Contractor from full responsibility in anticipating and locating their actual existence. No extra payment will be allowed for the removal, replacement, repair, or possible increased cost caused by inadvertent or planned interception and breaking of underground obstructions which may exist.
- C. The Contractor, in conjunction with the affected utility company(s), shall locate and establish the horizontal and vertical location of all utilities shown on the Plans and marked in the field. This may be done on an area by area basis, but shall be accomplished at least 5 working days in advance of the date of construction within such area and prior to any fabrication. Potholing for key utility crossing (those shown within 1 foot vertical of new force main) is required prior to pipeline shop drawing submission. Discrepancies (horizontal and/or vertical) between the locations of a utility found by the potholing operation than that shown on the Plans shall be brought to the Engineer's attention immediately. The Engineer shall determine if field revisions are necessary, and if so, make the revision. In the event utility(s) relocation is determined necessary, the utility company

involved will be responsible for relocation or the general contractor will perform therelocation as extra work.

- D. Damaged traffic loops shall be replaced and function within 48 hours of their destruction.

**END OF SECTION**

## SECTION 02 0210

### SITE PREPARATION

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Site grading consists of clearing, stripping, excavation, over excavation, moisture conditioning, soil treatment and recompaction.
- B. Clear site and dispose of plant life and grass.
- C. Remove and dispose of trees and shrubs.
- D. Remove and dispose of root system of trees and shrubs.
- E. Topsoil excavation and stockpiling.

##### 1.2 REFERENCES

- A. California Department of Transportation (Caltrans) Standard Specifications

##### 1.3 REGULATORY REQUIREMENTS

- A. Conform to applicable codes and local, state and federal regulations for disposal of debris and use of herbicides. Burning of debris, lumber or scrap will not be permitted.
- B. Coordinate clearing work with the Engineer.

#### PART 2 PRODUCTS

##### 2.1 CLEARED AND STRIPPED MATERIALS

- A. Cleared Materials - Removed from areas to be graded and dispose of in areas designated by the Owner.
- B. Stripped Materials - Stripped materials shall not be reused as compacted fill and shall either be removed from the site or stockpiled for later use in landscape areas, if required.
- C. Topsoil- Topsoil shall be saved and stockpiled in separate location from fill materials.

#### PART 3 EXECUTION

##### 3.1 GENERAL

- A. Clear and grub future planting and paved areas as shown on the Plans or as specified herein. Grubbing shall include clearing the entire root systems of all plants, weeds, grasses and deleterious materials, such as, asphalt, aggregate base and concrete, etc.
- B. Dust Control: Prevent the formation of an airborne dust nuisance by watering and/or treating the site of the work in such a manner that will confine dust particles to the immediate area of the work.
- C. Debris:

1. Remove debris as it accumulates, except as otherwise specified. Do not store or permit debris to accumulate on the site. If contractor fails to remove excess debris promptly, the Owner reserves the right to cause same to be removed at Contractor's expense.
2. Materials requiring removal and demolition shall become the property of the contractor and shall be removed completely from site, unless noted otherwise on plans, and shall be disposed of at an approved site outside the city limits.
3. If unforeseen items are encountered during clearing and demolition work, the Contractor shall notify the City Inspector prior to removal or demolition.

D. Topsoil:

1. Top 6" of all planting areas shall be top soil.

**3.2 CLEARING AND STRIPPING**

- A. Clearing - The areas to be graded shall be cleared of asphalt pavement, roots, and debris.
- B. Stripping- Where encountered, the upper natural soils or fill containing grass, roots and other vegetation shall be stripped from all areas to be graded. This material shall not be reused as compacted fill. Deep stripping in localized areas may be required by the Geotechnical Engineer to remove roots or other concentrations of vegetation

**3.3 FIELD QUALITY CONTROL**

- A. The Geotechnical Engineer will observe the clearing and stripping operations and recommend the maximum depth of stripping required and any over-excavation necessary due to contamination of vegetation, over sized debris, etc. of materials or concentration of vegetation. In addition, the Geotechnical Engineer will observe the over-excavation, moisture conditioning and recompaction operations. After the completion of these operations and before placement of fill, the Contractor shall obtain the Geotechnical Engineers approval of the site preparation in each area.

**3.4 PROTECTION**

- A. Locate, identify, and protect utilities that remain, from damage.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping.
- C. Protect benchmarks and existing structures that are to remain from damage or displacement.

**END OF SECTION**

## SECTION 02 4100

### DEMOLITION AND SALVAGE

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Demolition, including but not limited to: asphalt pavement, concrete sidewalks, pavement markings, signs, posts, etc.
  - 2. Demolition of perimeter fencing systems as required.
  - 3. Demolition, abandonment, removal/disposal, salvage, or relocation of underground utilities, as necessary to accomplish the work.
  - 4. Cutting and alterations for completion of the Work.
  - 5. Removing designated items for reuse and Owner's retention.
  - 6. Protecting existing potable water well.
  - 7. Removing demolished materials.

##### 1.2 SUBMITTALS

- A. Provide submittals in accordance with the General Conditions and Special Provisions.
- B. Demolition Work Plan:
  - 1. Submit procedures to accomplish the work 14 days prior to start of demolition.
  - 2. Procedures include:
    - a. Safe conduct of the work
    - b. Proper removal and disposition of materials and equipment
    - c. Protection of property to remain undisturbed
    - d. Coordination with existing facilities to remain in-service
    - e. Timely disconnection of utility services.
    - f. Detailed description of the methods and equipment to be used for each operation, and the sequence of operation.
- C. Shop Drawings:
  - 1. Indicate demolition and removal sequence.
  - 2. Indicate location of items designated for reuse and Owner's retention.
  - 3. Indicate location and construction of temporary work.

##### 1.3 CLOSEOUT

- A. Project Record Documents: Accurately record actual locations of capped utilities, concealed utilities discovered during demolition, subsurface obstructions, and relocated underground utility lines.
- B. Operation and Maintenance Data: Submit description of system, inspection data, and parts lists.

##### 1.4 QUALITY ASSURANCE

- A. Conform to applicable federal, state, and local codes and regulations for demolition work, dust control, products requiring electrical disconnection and re-connection.

- B. Conform to applicable federal, state, and local codes and regulations for procedures when hazardous or contaminated materials are discovered.
- C. Obtain required permits from authorities having jurisdiction.
- D. Provide dust control. Do not use water if it results in hazardous or objectionable conditions such as flooding, or pollution.

#### **1.5 PROTECTION**

- A. Provide traffic control devices.
- B. Carefully inspect existing facilities prior to work to determine the extent of the work.
- C. Prevent damage to existing facilities. At a minimum, damages to such facilities shall be repaired or replaced to existing condition at no additional cost to the Owner.
- D. Provide shoring, bracing and supports to ensure structural elements are not overloaded. Remove temporary protection when the work is complete or when authorized by the Owner.

#### **1.6 PRE-INSTALLATION MEETINGS**

- A. Convene minimum one week prior to commencing work of this section.
- B. Required attendees:
  - 1. Contractor's Responsible Team
  - 2. Owner's Representative

#### **1.7 SEQUENCING**

- A. Owner will conduct salvage operations before demolition begins to remove materials Owner chooses to retain as indicated on drawings.

#### **1.8 SCHEDULING**

- A. Schedule Work to coincide with new construction.
- B. Cooperate with Owner in scheduling noisy operations and waste removal that may impact Owners operations and adjoining spaces.
- C. Coordinate utility service interruptions with Owner.
  - 1. Provide notice to owner within 72 hours for coordination and shutdown.
  - 2. Schedule tie-ins to existing systems to minimize disruption.
  - 3. Coordinate Work to ensure life safety systems remain in full operation in occupied areas.

#### **1.9 PROJECT CONDITIONS**

- A. Conduct demolition to minimize interference with adjacent and occupied building areas.

### **PART 2 PRODUCTS - Not Used**

### **PART 3 EXECUTION**

#### **3.1 PREPARATION**

- A. Notify affected utility companies before starting work and comply with their requirements.



- B. Mark location and termination of utilities.
- C. Erect, and maintain temporary barriers and security devices, including warning signs and lights, and similar measures, for protection of the public, Owner, and existing improvements indicated to remain.

### **3.2 SALVAGE REQUIREMENTS**

- A. Coordinate with Owner to identify building components and equipment required to be removed and delivered to Owner.
- B. Tag components and equipment Owner designates for salvage.
- C. Protect designated salvage items from demolition operations until items can be removed.
- D. Package small and loose parts to avoid loss.
- E. Mark equipment and packaged parts to permit identification and consolidation of components of each salvaged item.
- F. Prepare assembly instructions consistent with disassembled parts. Package assembly instructions in protective envelope and securely attach to each disassembled salvaged item.
- G. Deliver salvaged items to Owner. Obtain signed receipt from Owner.

### **3.3 DEMOLITION**

- A. Conduct demolition to minimize interference with adjacent areas.
- B. Maintain protected egress from and access to adjacent existing areas at all times.
- C. Do not close or obstruct roadways and sidewalks without permits.
- D. Cease operations immediately when structure appears to be in danger and notify Owner.
- E. Disconnect and remove designated utilities within demolition areas.
- F. Cap and identify abandoned utilities at termination points when utility is not completely removed. Annotate Record Drawings indicating location, type and size of service for capped utilities remaining after demolition.
- G. Demolish **in** orderly and careful manner. Protect existing improvements, supporting structural members.
- H. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.
- I. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.
- J. Remove temporary Work.

**END OF SECTION**

**SECTION 03 1000**  
**CONCRETE FORMING AND ACCESSORIES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: All labor, materials and equipment and all operations required to complete all formwork as indicated on the drawings; to produce shapes and configurations as shown, as required; and as specified herein, including:
  - 1. Forms, shores, bracing, removal and other operations as necessary for all cast-in-place concrete and masonry placed.
  - 2. Setting and securing anchor bolts and other metal items embedded in concrete into formwork, using materials and layouts furnished and delivered to jobsite as specified under other sections.
- B. Related Sections:
  - 1. Pertinent Sections of Division 03 specifying concrete construction.
  - 2. Pertinent Sections of other Divisions specifying work to be embedded in concrete or work penetrating concrete foundations and formwork.

**1.02 REFERENCES**

- A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC): Chapter 19 Concrete.
- B. American Concrete Institute (ACI) 347 "Recommended Practice for Concrete Formwork".
- C. American Plywood Association (APA) "Concrete Forming Guide".
- D. West Coast Lumberman Inspection Bureau (WCLIB) "Standard Grading Rules for West Coast Lumber".
- E. ACI SP-066 "ACI Detailing Manual".
- F. ACI 301 "Specifications for Structural Concrete".
- G. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice".

**1.03 DESIGN REQUIREMENTS**

- A. Design, engineer, and construct formwork, shoring and bracing to conform to design and code requirements, resist imposed loads; resultant concrete to conform to required shape, line and dimension.

**1.04 SUBMITTALS**

- A. Limitation of review: Structural Engineer's review will be required only where specifically requested for structural applications and features only. Contractor is responsible for structural stability, load-resisting characteristics and sufficiency of form work design.

## 1.05 QUALITY ASSURANCE

- A. General: All form materials shall be new at start of work. Produce high quality concrete construction. Minimize defects due to joints, deflection of forms, roughness of forms, nonconforming materials, concrete or workmanship.
- B. Reuse of Forms: Plywood forms may be reused, if thoroughly cleaned of all dirt, mortar, and foreign materials, and undamaged at edges and contact face. Reuse shall be subject to permission from the Engineer without exception, and issued in writing. Reuse of any panel which will produce a blemish on exposed concrete, will not be permitted.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Form Materials:
  - 1. Non-Exposed Surface Formwork Facing: Forms for concrete which is not exposed to view, may be of plywood as specified for exposed surfaces, or square edge 1x nominal Douglas Fir, Construction Grade, S4S.
  - 2. Exposed Surface Formwork Facing:
    - a. Forms for all exterior and interior concrete flat surfaces unless otherwise specified as board formed shall be new Douglas Fir Plywood (APA) ply, 5/8-inch, B-B Plyform, Class 1, Exterior Type, oiled and edged and edge-sealed conforming to U.S. Product Standard PS 1 in large sheet sizes to achieve joint patterns shown.
    - b. All exposed concrete edges shall be chamfered 3/4" minimum or as noted on the drawings.
  - 3. Exposed Surface Formwork - Special Pattern Form Liner:
    - a. Forms for all exterior and interior concrete flat surfaces indicated shall be as designated by Landscape Architect.
- B. Earth Forms: Allowed, subject to soil standing in excavations without ravel or caving.
- C. Form Release Agent: Spray-on compound, not affecting color, bond or subsequent treatment of concrete surfaces. Maximum VOC content shall comply with local requirements and California Green Building Code.
- D. Accessories: Types recommended by manufacturers or referenced standards to suit conditions indicated;
  - 1. Anchors, spacers, void in-fill materials: sized to resist imposed loads.
  - 2. Form Ties: Prefabricated rod, flat band, or wire snap ties with 1" break-back or threaded internal disconnecting type with external holding devices of adequate bearing area. Ties shall permit tightening and spreading of forms and leave no metal closer than 1" to surface.
- E. Corner Chamfers and Rustications: Filleted, wood strip or foam type; sizes and shapes as detailed, or 3/4 x 3/4 inch size minimum if not detailed; maximum possible lengths.
- F. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Inspect the substrate and the conditions under which concrete formwork is to be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates and conditions.
- B. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

### 3.02 EARTH FORMS

- A. If natural soil or compacted fill can be accurately cut and maintained, foundations and grade beams may be poured against earth without forming. Provide positive protection of trench top corners.
- B. Maintain earth forms free of water and foreign materials.

### 3.03 ERECTION - FORMWORK

- A. General: Construct formwork in accordance with calculations, and recommendations of Chapter 3 of ACI 347. Construct forms to the sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in finished structure. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required. Use selected materials to obtain required finishes.
  - 1. Construct cambers specified in concrete members and slabs in the formwork.
  - 2. Schedule the work and notify other trades in ample time so that provisions for their work in the formwork can be made without delaying progress of the project. Install all sleeves, pipes, etc. for building services systems, or other work. Secure information about and provide for all openings, offsets, recessed nailing blocks, channel chases, anchors, ties, inserts, etc. in the formwork before concrete placement.
  - 3. Deflection: Formwork and concrete with excessive deflection after concrete placement will be rejected. Excessive deflection is that which will produce visible and noticeable waves in the finished concrete.
  - 4. Measure formwork for elevated structural slabs, columns, wall elevations points of maximum camber and submit in writing to the Engineer prior to placing concrete.
- B. Formwork Construction: Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301. Uniform, substantial and sufficiently tight to prevent leakage of concrete paste, readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials. Tie, brace, shore, and support to insure stability against pressures from any source, without failure of any component part and without excessive deflection. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.
- C. Provide all openings, offsets, inserts, anchorages, blocking, and other features of the work as shown or required. See INSERTS, EMBEDDED PARTS, AND OPENINGS for detailed requirements.
- D. Warped, checked, or scuffed forms will be rejected.

- E. Maintain membranes, reinforcing and other work free of damage; protect with plywood runway boards or other positive, durable means.
- F. Align joints and make watertight. Keep form joints to a minimum.
- G. Provide fillet and chamfer strips on external corners of exposed locations and as indicated to form patterns in finished work. Extend patterns around corners and into alcoves, on backs of columns and similar locations not otherwise shown.
  - 1. Produce beveled, smooth, solid, unbroken lines, except as otherwise indicated to conform to patterns.
  - 2. Form corners and chamfers with 3/4 inch x 3/4 inch strips, unless otherwise indicated, accurately formed and surfaced to produce uniformly straight lines and tight edge joints. Extend terminal edges to required limit and miter chamfer at changes in direction.
- H. Unexposed corners may be formed either square or chamfered.
- I. Ties and Spreaders: Arrange in a pattern acceptable to the Engineer when exposed. Snap-ties may be used except at joints between pours where threaded internal disconnecting type shall be used.
- J. Coordinate this section with other sections of work that require attachment of components to formwork.
- K. Reglets and Rebates: Accurately locate, size, and form all reglets and rebates required to receive work of other trades, including flashing, frames, and equipment.

#### **3.04 APPLICATION - FORM RELEASE AGENT**

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not allow excess form coating material to accumulate in the forms or to come into contact with reinforcement or surfaces which will be bonded to fresh concrete.
- D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork will be rejected.
- E. Leave no residue or stain on the face of the concrete, nor affect bonding of subsequent finishes or work specified in other sections.

#### **3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS**

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
  - 1. Provide openings in concrete formwork to accommodate work of other sections including those under separate contracts (if any). Size and location of openings, recesses and chases shall be in accordance with the section requiring such items. Accurately place and securely support items to be built into forms.
- B. Construction Joints: Construct and locate generally as indicated on Drawings and only at locations approved by Structural Engineer, so as not to impair the strength of the structure. Form keys in all cold joints shown or required.
- C. Locate and set in place items that will be cast directly into concrete.

- D. Rough Hardware and Miscellaneous Metal: Set inserts, sleeves, bolts, anchors, angles, and other items to be embedded in concrete. Set embedded bolts and sleeves for equipment to template and approved shop drawings prepared by trades supplying equipment.
- E. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- F. Wood Inserts and Nailers: Provide approved preservative-treated lumber. Set all required nailing blocks, grounds, and other inserts as required to produce results shown. Wood plugs shall not be used.
- G. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- H. Piping: Do not embed piping in structural concrete unless locations specifically approved by Structural Engineer.
- I. Conduit: Place conduit below slabs-on-grade and only as specifically detailed on structural drawings. Minimum clear distance between conduits shall be 3 diameters. Location shall be subject to Engineer's written approval and shall not impair the strength of the structure.
- J. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
  - 1. Provide openings for the introduction of vibrators at intervals necessary for proper placement.
  - 2. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.
- K. Install Form Liner inserts in accordance with manufacturer's recommendations, to produce patterns and textures indicated.
- L. Install waterstops in accordance with manufacturer's recommendations to provide continuous waterproof barrier.

### **3.06 FORM CLEANING**

- A. Clean forms as erection proceeds, remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
  - 1. Remove all dirt, chips, sawdust, rubbish, water and foreign materials detrimental to concrete.
  - 2. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

### **3.07 FOOTINGS**

- A. Verify elevations and provide final excavation required for footings prior to placing of concrete.

### **3.08 EQUIPMENT BASES**

- A. Form concrete bases for all mechanical and electrical equipment in accordance with approved shop details furnished by other sections.
- B. Sizes and locations as indicated and as required to produce results shown.

- C. Provide coved base for all equipment bases placed on concrete slabs.

### **3.09 FORMWORK TOLERANCES**

- A. Construct formwork to maintain tolerances required by ACI 301.

### **3.10 FIELD QUALITY CONTROL**

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.
- B. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.
- C. Clean and repair surfaces to be re-used in the work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact surfaces as specified for new formwork.
- D. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets.

### **3.11 FORM REMOVAL**

- A. Do not loosen or remove forms before minimum curing period has elapsed without employment of appropriate alternate curing methods, approved by the Engineer in writing.
- B. Remove forms without damage to the concrete using means to ensure complete safety of the structure and without damage to exposed beams, columns, wall edges, chamfers and inserts. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Do not remove forms until the concrete has hardened sufficiently to permit safe removal and the concrete has attained sufficient strength to safely support imposed loads. The minimum elapsed time for removal of forms after concrete has been placed shall be as follows:
  - 1. Retaining Walls: 21 days minimum.
  - 2. Footings: 7 days minimum. If backfilled immediately, side forms may be removed 24 hours after concrete is placed.
- D. Durations listed above are minimums and are subject to extension at the sole judgment of the Engineer.
- E. Reshoring: Reshore members where and if required by the Engineer.
- F. Do not subject concrete to superimposed loads (structure or construction) until it has attained full specified design strength, nor for a period of at least 14 days after placing.
- G. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

### **3.12 CLEANING**

- A. Remove excess material and debris associated with this work from the job site.

**END OF SECTION**



**SECTION 03 2000**  
**CONCRETE REINFORCING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Reinforcing steel work for all concrete and masonry work as indicated on the drawings and specified herein.
  - 2. Coordinate this work with other work affected by these operations, such as forms, electrical work, mechanical work, structural steel, masonry and concrete.
  
- B. Related Sections:
  - 1. Pertinent Sections of Division 01 specifying Quality Control and Testing Laboratory services.
  - 2. Pertinent Sections of Divisions 03 specifying concrete construction.
  - 3. Pertinent Sections of Divisions 04 specifying masonry construction.
  - 4. Pertinent Sections of other Divisions specifying work to be embedded in concrete or work penetrating concrete work.

**1.02 REFERENCE STANDARDS**

- A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC) Chapter 19 Concrete.
- B. American Concrete Institute (ACI) 301 "Specifications for Structural Concrete for Buildings".
- C. ACI 318 "Building Code Requirements for Reinforced Concrete and Commentary".
- D. ACI SP-066 "ACI Detailing Manual".
- E. American Society for Testing and Materials (ASTM) A1064 "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete".
- F. ASTM A615 "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement".
- G. ASTM A706 "Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement".
- H. American Welding Society (AWS) D1.4 - "Structural Welding Code for Reinforcing Steel".
- I. Concrete Reinforcing Steel Institute (CRSI) - "Manual of Standard Practice".
- J. CRSI - "Placing Reinforcing Bars".

**1.03 SUBMITTALS**

- A. Submit in accordance with pertinent sections of Division 01 specifying submittal procedures. Submit for review prior to fabrication.
- B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents. The General Contractor shall review and approve shop drawings prior to submittal to the Engineer.

- C. Shop Drawings: Show complete fabrication and placing details of all reinforcing steel. Comply with requirements of ACI SP-66. Include:
  - 1. Bar sizes and schedules;
  - 2. Shapes of bent bars, layout and spacing of bars, location of splices.
  - 3. Stirrup spacing, arrangements and assemblies,
  - 4. References to Contract Document detail numbers and designations.
  - 5. Wall elevations corresponding to elevations shown in Contract Documents.
- D. Product Data: Submit manufacturer's product data, specifications, location and installation instructions for proprietary materials and reinforcement accessories. Provide samples of these items upon request.
- E. Certificates: Submit all certifications of physical and chemical properties of steel for each heat number as manufactured, including location of material in structure as specified below in Article titled QUALITY ASSURANCE. All materials supplied shall be tagged with heat numbers matching submitted Mill Test Report analyses.
- F. Samples: Provide to the Owner's Testing laboratory as specified in Article SOURCE QUALITY CONTROL.

#### 1.04 QUALITY ASSURANCE

- A. Perform work of this Section in accordance with the CRSI "Manual of Standard Practice", CRSI "Placing Reinforcing Bars", ACI 301, and ACI 318.
- B. Requirements of Regulatory Agencies, refer to pertinent Sections of Division 01 and CBC.
- C. Certification and Identification of Materials and Uses: Provide Owner's Testing Agency with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection and all material identification/test information listed below.
  - 1. Provide manufacturer's Mill Test Reports for all materials. Include chemical and physical properties of the material for each heat number manufactured. Tag all fabricated materials with heat number.
  - 2. Provide letter certifying all materials supplied are from heat numbers covered by supplied mill certificates. Include in letter the physical location of each grade of reinforcing and/or heat number in the project (i.e. foundations, walls, etc.).
  - 3. Unidentified Material Tests: Where identification of materials by heat number to mill tests cannot be made, Owner's Testing Agency shall test unidentified materials as described below.
- D. Testing and Inspection: Tests and Inspections required by Independent Testing Agency are specified below in Articles SOURCE QUALITY CONTROL and FIELD QUALITY CONTROL. Duties and limitations of Independent Testing Agency, test costs and test reports in conformance with pertinent Sections of Division 01.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Comply with pertinent requirements of Division 01.
- B. Deliver reinforcement to project site in bundles marked with durable tags indicating heat number, mill, bar size and length, proposed location in the structure and other information corresponding with markings shown on placement diagrams.
- C. Handle and store materials above ground to prevent damage, contamination or accumulation of dirt or rust.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Reinforcing Steel: Deformed billet steel bars, ASTM A706 Grade 60 or ASTM A615 Grade 60.
  - 1. Welded reinforcement shall be ASTM A706, or A615 meeting carbon requirements of AWS D1.4. Welding shall conform with AWS D1.4.
  - 2. All reinforcement to be unfinished.
  - 3. ASTM A615 reinforcement at special structural concrete walls, concrete coupling beams, and special concrete moment frames shall have maximum yield stress of 78,000 psi and the tensile strength shall be greater than 125% of the actual yield strength. Test ASTM A615 reinforcement for conformance to these criteria prior to fabrication and/or installation.
- B. Welded Wire Reinforcement: ASTM A1064.
- C. Tie Wire: No. 16 AWG or heavier, black annealed.
- D. Concrete Blocks: On-grade conditions only, as required to support reinforcing bars in position.
- E. Reinforcing Supports: Plastic or galvanized steel chairs, bolsters, bar supports, or spacers sized and shaped for adequate support of reinforcement and construction loads imposed during concrete placement, meeting ACI and CRSI standards.
  - 1. For use over formwork: Galvanized wire bar type supports complying with CRSI recommendations. Provide plastic tips where exposed to view or weather after removal of formwork. Do not use wood, brick, or other unacceptable materials.
- F. Reinforcement Splice Couplers: For use only where specified on drawings. Submit other locations proposed for use to Engineer for review. "L-Series Bar Lock" Coupler Systems for Splicing Reinforcement Bars, UES ER-0319, by Dayton-Superior Corporation.

### **2.02 FABRICATION**

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4), unless specifically shown otherwise. Details not specifically shown or indicated shall conform to SP-066 and specified codes and standards.
  - 1. Accurately shop-fabricate to shapes, bends, sizes, gauges and lengths indicated or otherwise required.
  - 2. Bend bars once only. Discard bars improperly bent due to fabricating or other errors and provide new material; do not re-bend or straighten unless specifically indicated. Rebending of reinforcement in the field is not allowed.
  - 3. Do not bend reinforcement in a manner that will injure or weaken the material or the embedding concrete.
  - 4. Do not heat reinforcement for bending. Heat-bent materials will be rejected.
- B. Unacceptable materials: Reinforcement with any of the following defects will not be permitted in the work.
  - 1. Bar lengths, depths and bends exceeding specified fabrication tolerances.
  - 2. Bends or kinks not indicated on Drawings or final shop drawings.
  - 3. Bars with reduced cross-section due to rusting or other cause.
- C. Tag reinforcement with durable identification to facilitate sorting and placing.
- D. Shop Fusion Welded Stirrup/Tie/Spiral Cages

1. Shop fusion welding of stirrup/tie/spiral cages is permitted to aid in fabrication and handling. The following requirements shall be met.
2. All reinforcing bars receiving weld shall be ASTM A706.
3. Longitudinal holding wires shall be ASTM A1064.
4. Shop welding shall be performed by machines under a continuous, controlled process.
5. Quality control tests shall be performed on shop-welded specimens and the test results shall be available, upon request, to the Engineer.
6. Tack welding of reinforcing steel is not permitted.
7. Welding of any type shall not occur at 90°, 135°, or 180° bends. Circular ties and spirals may be shop fusion welded outside of areas with 90°, 135°, or 180° hook bends.
8. Longitudinal bars shall not be welded to stirrups/ties/spirals.

### **2.03 SOURCE QUALITY CONTROL**

- A. The Testing Agency, as specified in the Article QUALITY ASSURANCE, will perform the following:
  1. Material Testing:
    - a. Identified Steel: When samples are taken from bundled steel identified by heat number, matched with accompanying mill analyses as delivered from the mill, supplemental testing of reinforcing steel is not required.
    - b. Unidentified Steel: When identification of materials by heat number matched to accompanying mill analyses cannot be made, perform one tensile test and one bend test per each two and one-half tons or fraction thereof for each required size of reinforcing steel. Tests of unidentified steel shall be performed by the Owner's Testing Agency and costs for these tests shall be paid by the Contractor by deductive change order.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Inspect the conditions under which concrete reinforcement is to be placed. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Coordinate with work of other sections to avoid conflicts or interference. Bring conflicts between reinforcement and other elements to Engineer's attention. Resolve conflicts before concrete is placed.
- C. Notify Structural Engineer, and Authority Having Jurisdiction for review of steel placement not less than 48 hours before placing concrete.

### **3.02 PLACEMENT**

- A. General: Comply with the specified codes and standards, and Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- B. Clean bars free of substances which are detrimental to bonding. Maintain reinforcement clean until embedded in concrete.
- C. Place reinforcement to obtain the minimum coverages for concrete protection. Do not deviate from required position. Maintain required distance, spacing and clearance between bars, forms, and ground.
- D. Location and Support: Provide metal chairs, runners, bolsters, spacers and hangers, as required.

- E. Provide additional steel reinforcement as necessary or as directed, to act as spreaders or separators to maintain proper positioning.
- F. Tying and Attachment: Securely tie at all intersections and supports with wire. Prevent dislocation or movement during placement of concrete. Direct twisted ends of wire ties away from exposed concrete surfaces.
- G. Separate reinforcing from pipes or conduits with approved non-metallic separators. Do not use wood or steel form stakes or reinforcement used as stakes as support for reinforcement.
- H. Accommodate placement of formed openings required by other sections.
- I. Obstructions:
  - 1. Where obstructions, block-outs, or penetrations (conduits, raceways, ductwork) prevent continuous placement of reinforcement as indicated, provide additional reinforcing as detailed and as directed by the Structural Engineer to supplement the indicated reinforcement around the obstruction.
  - 2. Place additional trim bars, ties, stirrups, or other elements as detailed and as directed at all opening, sleeves, pipes or other penetrations through structural elements.
- J. Welded Wire Reinforcement: Reinforce slabs with 6"x 6"-W1.4 x W1.4 welded wire reinforcement reinforcing, unless otherwise noted on drawings.
  - 1. Provide flat sheets only, no rolls. Straighten, cut to required size, and lay out flat in place.
  - 2. Securely wire-tie reinforcement to other reinforcement at frequent intervals.
  - 3. Extend reinforcement over supporting beams and walls, and to within 1 inch of edge of slabs, construction joints, and expansion joints.
  - 4. Support reinforcement in mid-depth of slab.
  - 5. Lift reinforcement at intervals as slab concrete is placed, ensure proper embedment.

### **3.03 REINFORCING SPACING AND COVERAGE**

- A. Spacing: Do not space bars closer than four (4) diameters of the largest of two adjacent bars, except at bar laps, which shall be placed such that a minimum of 2 bar diameters is clear between bars.
- B. Where reinforcing in members is placed in two layers, the distance between layers shall not be less than four bar diameters of the largest bar and the bars in the upper layers shall be placed directly above those in the bottom layer, unless otherwise detailed or dimensioned.
- C. Coverage of bars (including stirrups and columns ties) shall be as follows, unless otherwise shown:
  - 1. Footings and Mat Foundation: 3 inches to any soil face, 2 inches to top.
  - 2. Walls: 1-1/2 inches clear to form and 2 inches clear to form at soil face.

### **3.04 DOWELS, SPLICES, OFFSETS AND BENDS**

- A. Provide standard reinforcement splices at splices, corners, and intersections by lapping ends, placing bars in contact, and tightly tying with wire at each end. Comply with details shown on structural drawings and requirements of ACI 318.
- B. Provide minimum 1-1/2 inch clearance between sets of splices. Stagger splices in horizontal bars so that adjacent splices will be 4 feet apart.
- C. Laps of welded wire reinforcement shall be at least two times the spacing of the members in the direction lapped but not less than twelve inches.

- D. Splices of reinforcement shall not be made at points of maximum stress. Provide splice lengths as noted on the structural drawings, with sufficient lap to transfer the stress between bars by bond and shear.
- E. Spacing:
  - 1. Space bars minimum distance specified and all lapped bars 2 bar diameters (minimum) clear of the next bar.
  - 2. Stagger splices of adjacent bars where possible and where required to maintain bar clearance.
  - 3. Request Engineer review prior to placement for all splices not shown on the drawings.
- F. Reinforcement Couplers: Install at all locations indicated. Install couplers in accordance with manufacturer's recommendations.

### **3.05 WELDING**

- A. No reinforcing shall be welded unless specifically indicated. No reinforcing shall be welded without prior approval of the Structural Engineer and the Authority Having Jurisdiction.
- B. Only when so approved for use as noted above, all welding shall conform to AWS D1.4, ACI 318 Section 26.6.4, and the following:
  - 1. All welding performed by certified welders.
  - 2. All reinforcement requires preheat prior to welding. All preheat and welding shall be continuously inspected by the Testing Agency.

### **3.06 MISPLACED REINFORCEMENT**

- A. Notify Engineer immediately if reinforcing bars are known to be misplaced after concrete has been placed.
- B. Perform no correction or cutting without specific direction. Do not bend or kink misplaced bars.
- C. Correct misplaced reinforcing only as directed in writing by the Engineer. Bear all costs of redesign, new, or additional reinforcing required because of misplaced bars at Contractor's expense.

### **3.07 FIELD QUALITY CONTROL**

- A. The Testing Agency as specified in the Article QUALITY ASSURANCE, will inspect the work for conformance to contract documents before concrete placement.
  - 1. Inspection: Provide inspection and verification of installed reinforcement. Confirm that the surface of the rebar is free of form release oil or other coatings.
  - 2. Inspect all preheat and welding activities for steel reinforcement, when these occur.
  - 3. Exception: Shallow foundations & non-structural slabs-on-grade supporting buildings of no greater than three stories and either of concrete design strength 2500psi (or greater) or supporting light-frame construction do not require special inspection. Non-structural patios, driveways, and sidewalks do not require special inspection.

### **3.08 CLEANING**

- A. Remove excess material and debris associated with this work from the job site.

**END OF SECTION**

**SECTION 03 3000**  
**CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Provide all labor, materials, equipment and services to complete all concrete work required, including, but not limited to, the following:
  - 1. Foundations, beams, columns, elevated slabs, slabs-on-grade, walls, and retaining walls.
  - 2. Installation of all bolts, inserts, sleeves, connections, etc. in the concrete.
  - 3. Joint devices associated with concrete work.
  - 4. Miscellaneous concrete elements, including, but not limited to: equipment pads, light pole bases, flagpole bases, thrust blocks, and manholes.
  - 5. Concrete curing.
  - 6. Coordination with other sections:
    - a. Make all preparations and do all work necessary to receive or adjoin other work. Install all bolts and anchors, including those furnished by other sections, into formwork and provide all required blocking.
    - b. Install all accessories embedded in the concrete and provide all holes, blockouts and similar provisions necessary for the work of other sections. Provide all patching or cutting made necessary by failure or delay in complying with this requirement at the Contractor's expense.
    - c. Coordinate with other sections for the accurate location of embedded accessories.
- B. Related Sections:
  - 1. General Conditions and Special Provisions.
  - 2. Pertinent Sections of Division 03 specifying concrete construction.
  - 3. Pertinent Sections of other Divisions specifying work to be embedded in concrete or work penetrating concrete.
  - 4. Pertinent sections of other Divisions specifying floor finishes and sealants applied to concrete substrates.

**1.02 REFERENCES**

- A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC) Chapter 19 Concrete.
- B. American Concrete Institute (ACI) 211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete"; ACI 211.2 "Standard Practice for Selecting Proportions for Lightweight Concrete".
- C. ACI 301 "Specifications for Structural Concrete".
- D. ACI 302.1R "Guide for Concrete Floor and Slab Construction".
- E. ACI 304R "Guide for Measuring, Mixing, Transporting, and Placing Concrete".
- F. ACI 305R "Hot Weather Concreting".
- G. ACI 306R "Cold Weather Concreting".
- H. ACI 308 "Standard Practice for Curing Concrete".
- I. ACI 318 "Building Code Requirements for Reinforced Concrete and Commentary".

**1.03 SUBMITTALS**

- A. The General Contractor shall review and approve shop drawings prior to submittal to the Engineer. Submittals that do not meet these requirements will be returned for correction without review. Submit for review prior to fabrication.
- B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents.
- C. Product Data: Submit manufacturers' data on manufactured products and other concrete related materials such as bond breakers, cure/sealer, admixtures, etc. Demonstrate compliance with specified characteristics. Provide samples of items upon request.
- D. Mix Designs: Submit Mix Designs for each structural concrete type required for work per requirements of articles CONCRETE MIXES and QUALITY ASSURANCE. Resubmit revised designs for review if original designs are adjusted or changed for any reason. Non-Structural mixes need not be submitted for review by Structural Engineer.
- E. Shop Drawings: Proposed location of construction and cold joints. Proposed location of all slab construction/dowel joints, control joints, and blockouts.
- F. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction for concrete accessories.
- G. Batch Plant Certificates: Include with delivery of each load of concrete. Provide Certificates to the Testing Agency and the Engineer as separate submittals. Concrete delivered to the site without such certificate shall be rejected and returned to the plant. Each certificate shall include all information specified in Article SOURCE QUALITY CONTROL below.
- H. Engineering Analysis: Prepared by a California-licensed Civil or Structural Engineer, justifying construction-imposed loads on slabs, beams, and walls which exceed those allowed by CBC for the specified use.
  - 1. 2000 lbs maximum allowable construction load without analysis.
  - 2. 10,000 lbs maximum allowable construction load with analysis.
- I. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

#### 1.04 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Concrete construction verification and inspection to conform to CBC 1705.3.
- C. Common Sourcing: Provide each of the following materials from a single source for entire project.
  - 1. Cement.
  - 2. Fly ash.
  - 3. Aggregate.
  - 4. Ground Granulated Blast Furnace Slag.
- D. Follow recommendations of ACI 305R when concreting during hot weather. Follow recommendations of ACI 306R when concreting during cold weather.
- E. Services by the Independent Testing Agency (includes "Special" Inspections) as specified in this Section and as follows:
  - 1. Perform tests and inspections specified below in articles SOURCE QUALITY CONTROL and FIELD QUALITY CONTROL.
- F. Contractor shall bear the entire cost of remediation, removal, and/or replacement of concrete determined defective or non-conforming, including Engineer fees for redesign.



### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Materials specified by brand name shall be delivered in unbroken packages bearing manufacturer's label and shall be brand specified or an approved equal.
- B. Delivery, Handling and Storage of other materials shall conform to the applicable sections of the current editions of the various reference standards listed in this Section.
- C. Protect materials from weather or other damage. Sort to prevent inclusion of foreign materials.
- D. Specific Requirements:
  - 1. Cement: Protect against dampness, contamination, and warehouse set. Store in weather tight enclosures.
  - 2. Aggregates: Prevent excessive segregation, or contamination with other materials or other sizes of aggregates. Use only one supply source for each aggregate stock pile.
  - 3. Admixtures:
    - a. Store to prevent contamination, evaporation, or damage.
    - b. Protect liquid admixtures from freezing and extreme temperature ranges.
    - c. Agitate emulsions prior to use.

### 1.06 ENVIRONMENTAL REQUIREMENTS

- A. Cold Weather (Freezing or near-freezing temperatures) per ACI 306R:
  - 1. Heat concrete materials before mixing, as necessary to deposit concrete at a temperature of at least 50°F but not more than 90°F.
  - 2. Do not place concrete during freezing, near-freezing weather, snow, rain or sleet unless protection from moisture and/or cold is provided.
  - 3. Protect from freezing and maintain at a temperature of at least 50°F for not less than seven days after placing. Take special precautions to protect transit-mixed concrete.
  - 4. No salts, chemical protection or admixture are permitted without written approval of Engineer.
  - 5. Contractor shall maintain an air temperature log for the first 7 days after placement with entry intervals not to exceed 8 hours.
- B. Hot Weather per ACI 305R:
  - 1. Cool concrete materials before mixing, or add ice in lieu of mix water as necessary to deposit concrete at a temperature below 85°F.
  - 2. Do not place concrete in hot/windy weather without Engineer's review of procedures.
  - 3. Provide sunshades and/or wind breakers to protect flat work during finishing and immediate curing operations. Do not place flatwork concrete at air temperature exceeding 90°F.
  - 4. Provide modified mix designs, adding retarders to improve initial set times and applying evaporation reducers during hot/windy weather for review by Independent Testing Agency prior to use.

### 1.07 MOCK-UP

- A. Construct and erect mock-up panel for concrete surfaces indicated to receive special treatment or finish, as result of formwork.
  - 1. Panel Size: Sufficient to illustrate full range of treatment.
  - 2. Number of Panels: 2.
  - 3. Locate as indicated on drawings.
- B. If requested by Engineer, cast concrete against mock-up panel. Obtain acceptance of resulting surface finish prior to erecting formwork.

- C. Accepted mock-up panel is considered basis of quality for the finished work. Keep mock-up exposed to view for duration of concrete work.
- D. Mock-up may remain as part of the Work.

## 1.08 SCHEDULING AND SEQUENCING

- A. Organize the work and employ shop and field crew(s) of sufficient size to minimize inspections by the Testing Agency.
- B. Provide schedule and sequence information to Testing Agency in writing upon request. Update information as work progresses.

## PART 2 PRODUCTS

### 2.01 FORMWORK

- A. Comply with requirements of Section 03 1000.

### 2.02 REINFORCEMENT

- A. Comply with requirements of Section 03 2000.

### 2.03 MATERIALS

- A. General Requirements: All materials shall be new and best of their class or kind. All materials found defective, unsuitable, or not as specified, will be condemned and promptly removed from the premises.
- B. Cementitious Materials:
  - 1. Portland Cement: ASTM C150, Type II, low alkali conforming to CBC 1903.1.
  - 2. Fly Ash (Pozzolan): ASTM C618, Class F.
  - 3. Ground Granulated Blast Furnace Slag: ASTM C989, Grade 100 or 120.
- C. Concrete Aggregates:
  - 1. Coarse and Fine Aggregates: ASTM C33; Stone aggregate and sand. Specific source aggregate and/or sand or shrinkage characteristics as required for class of concrete specified.
  - 2. Lightweight aggregate: ASTM C330 and C332.
  - 3. Source shall remain constant throughout the duration of the job. The exact portions of the fine aggregates and coarse aggregates to be used in the mix shall be determined by the mix design.
- D. Water: Potable, clean, from domestic source.
- E. Admixtures: All admixtures shall be used in strict accordance with the manufacturer's recommendations. Admixtures containing calcium chlorides or other accelerators shall not be used without the approval of the Engineer and the Owner's Testing Laboratory.
  - 1. Mid-Range Water Reducing Admixtures: ASTM C494 Type A, "MasterPolyHeed" (formerly "PolyHeed") series by BASF, "WRDA" series by W.R. Grace, or equal.
  - 2. High Range Water-Reducing Admixtures: ASTM C494 Type F, "MasterRheoBuild 1000" (formerly "RheoBuild 1000") or "MasterGlenium" (formerly "Glenium") series by BASF or equal.
  - 3. Water Reducing Admixture and Retarder: ASTM C494 Type B or D, "MasterPozzololith" (formerly "Pozzololith") series or "MasterSet DELVO" (formerly "DELVO") series by BASF, "Plastiflow-R" by Nox-crete, or equal.
  - 4. Air Entraining Admixtures: ASTM C260, product suit condition by BASF or equal.

5. Viscosity Modifiers: ASTM C494 Type S.
- F. Slurry: Same proportion of cement to fine aggregates used in the regular concrete mix (i.e. only coarse aggregate omitted); well mixed with water to produce a thick consistency.
- G. High Strength Grout: ASTM C1107, non-shrink, premixed compound consisting of aggregate, cement, and water reducing plasticizing agents.
  1. Minimum Compressive Strength at 3 days: 3000 psi.
  2. Minimum Compressive Strength at 28 days: 7000 psi, placed in a "fluid" state.
  3. Provide only non-metallic grout at exposed work.
  4. Meet or exceed properties of BASF "Master Flow 928" mixed to fluid consistency. Other acceptable manufacturers: The Burke Company and W.R. Meadows, Inc.
- H. Dry Pack: Dry pack (used only for cosmetic concrete repairs) shall consist of:
  1. One part cement to 2-1/2 parts fine aggregate (screen out all materials retained on No.4 sieve), mixed with a minimum amount of water, added in small amounts.
  2. Mix to consistency such that a ball of the mixture compressed in the hand will retain its shape, showing finger marks, but without showing any surface water.

## 2.04 ACCESSORIES

- A. Bonding Agent: ASTM C881, Type II Grade 2 Class B or C. Do not allow epoxy to set before placing fresh concrete.
  1. "MasterEmaco ADH 326" (formerly "Concresive Liquid LPL") by BASF;
  2. "Rezi-Weld 1000" by W.R. Meadows.
- B. Chemical Hardener: Fluorosilicate solution designed for densification of cured concrete slabs. "MasterKure HD 300 WB" (formerly "Lapidolith") by BASF, "LIQUI-HARD" W.R. Meadows Co, or equal.
- C. Moisture-Retaining Cover: ASTM C171, type 1, one of the following;
  1. Regular Curing Paper, Type I, reinforced waterproof: Fortifiber Corporation "Orange Label Sisalkraft", "Pabcotite" paper, or equal.
  2. Polyethylene Film: ASTM D 2103, 4 mil thick, clear or white color.
  3. White-burlap-polyethylene sheet, weighing not less than 10 oz/per linear yd.
- D. Liquid Curing Compound: ASTM C 309, Type 1, Class B, clear or translucent, 25% minimum solids, water base acrylic cure/sealer which will not discolor concrete and compatible with bonding of finishes specified in related sections. W.R. Meadows Co. "Vocomp 25" or equal. Maximum VOC content shall comply with local requirements and California Green Building Code.
- E. Under Slab Water Vapor Retarder: Vapor retarder sheet to be ASTM E1745 Class A; 15 mil, single ply extruded polyolefin; permeance no greater than 0.01 U.S. Perms per ASTM E154, ASTM E96 procedure B or ASTM F1249.
  1. "Stego Wrap Vapor Barrier (15mil)" by Stego Industries LLC.
  2. "Vaporguard" by Reef Industries.
  3. Approved Equal.
- F. Evaporation Reducer: "MasterKure ER 50" (formerly Confilm), by BASF.
- G. Permeability Reducer: Use only where specifically referred to.
  1. Admixture Type: Xypex Chemical Corporation "XYPEX Admix C-500". Dosage: 2-3% of cement content by weight; 15 lb/cu. yd. max. or BASF "MasterLife 300D" (formerly "Rheomac 300D"). Dosage: 2% of cement by mass.
  2. Surface-Applied Type: Xypex Chemical Corporation "XYPEX Concentrate. Brush application: 1.25-1.50lb/sq. yd., 5 parts powder to 2 parts water. BASF "MasterSeal 500" (formerly Tegraproof"). Slurry coat: one part water to 2.25-2.5 parts powder by volume.

3. Approved equal.

## 2.05 JOINT DEVICES AND MATERIALS

- A. Waterstops: Resilient type, meeting Corps of Engineers CRD-C 572. Consult manufacturer for appropriate product for specific use. Submit for review. Install per manufacturers recommendation. Provide W. R. Meadows "Seal Tight" PVC waterstop, Sika "Greenstreak" PVC waterstop, or approved equal.
- B. Expansion Joint Filler: ASTM D1751, Nonextruding, resilient asphalt impregnated fiberboard or felt, 3/8 inch thick and 4 inches deep; tongue and groove profile.
  1. Products: "Servicised Products", W.R. Meadows, Inc., "National Expansion Joint Company", "Celotex Corporation", or equal.
- C. Joint Filler: ASTM D944, Compressible asphalt mastic with felt facers, 1/4 inch thick and 4 inches deep.
- D. Sealant and Primer: As specified in Section 07 9000.
- E. Slab Joint Sealant: Compatible with floor finishes specified in related sections.

## 2.06 CONCRETE MIXES

- A. General requirements for mix design and submittal of structural class concrete:
  1. Provide Contractor submittals to Engineer not less than 15 days before placing concrete.
  2. Contractor shall review mix designs and proposed placing requirements prior to submittal for compatibility to ensure that the concrete as designed can be placed in accordance with the drawings and specifications.
  3. Changes or revisions require re-submittal: All variations to approved mix designs, including changing type and/or quantity of admixtures shall be resubmitted to the Engineer for review prior to use.
  4. Mix design(s) for all structural classes of concrete to be prepared by qualified person experienced in mix design. Allow for time necessary to do trial batch testing when required.
  5. Preparer to provide backup data and certify in writing that mix design meets:
    - a. Requirements of the specifications for concrete durability and quality;
    - b. Requirements of the California Building Code and ACI 318 Section 26.4, including break histories, trial batching test results, and/or a mix designed by a California Registered Civil Engineer per ACI 318 Section 26.4.3.1(b) and bearing the Engineer's seal & signature.
  6. Clearly note on mix designs with specified maximum WCR if design permits addition of water on site, or clearly identify in the mix design that no water is to be added on site.
  7. Deviations: Clearly indicate proposed deviations, and provide written explanation explaining how the deviating mix design(s) will provide equivalent or better concrete product(s) than those specified.
  8. Include adjustments to reviewed mix designs to account for weather conditions and similar factors.
- B. Proportioning - General: The following provisions apply to all mix designs:
  1. Proportion concrete mixes to produce concrete of required average strength (as defined by ACI 318 Section 19.2.1). Select slump, aggregate sizes, shrinkage, and consistency that will allow thorough compaction without excessive puddling, spading, or vibration, and without permitting the materials to segregate, or allow free water to collect on the surface.
  2. Select aggregate size and type to produce dense, uniform concrete with low to moderate shrinkage, free from rock pockets, honeycomb and other irregularities.
  3. Mix designs may include water reducing and retarding admixtures to meet or exceed minimum set times (time required to place and finish) and to minimize Water Cement Ratios (WCR). Minimum and maximum criteria presented in this section are guidelines and do not represent a specific mix design.

4. Cement Content: Minimum cement content indicates minimum sacks of cementitious material. Increasing cement content to increase early strengths or to achieve specified WCR while maintaining water content is discouraged in order to minimize effects of shrinkage.
    - a. Substitution of fly ash for Portland cement on an equivalent weight basis up to 25% replacement is permitted, except at high early strength concrete. Replacement in excess of 25% is not permitted unless part of a specified mix design that has been submitted for review.
    - b. Substitution of slag for Portland cement on an equivalent weight basis up to 45% replacement is permitted, except at high early strength concrete. Replacement in excess of 45% is not permitted unless part of a specified mix design that has been submitted for review.
    - c. Such substitution requests may be denied by the Engineer.
  5. Water Content: Mix designs with a specified maximum Water Cement Ratio (WCR) may be designed with a lower WCR than specified in order to allow addition of water at the site.
  6. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301 and this section.
    - a. For trial mixtures method, employ independent testing agency acceptable to Engineer for preparing and reporting proposed mix designs.
  7. Placement Options: Mix designs may, at the Contractor's option, be designed for either pump or conventional placement with aggregate size, slumps, etc. to be maintained as specified in this section.
- C. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations and this section.

- D. Mix Design Minimum Requirements:

Concrete Class	Coarse Aggregate Size (Inches) & Fine Aggregate <sup>3</sup>	Maximum WCR or Maximum Nominal Slump & Tolerance (Inches) <sup>1,2</sup>	Minimum 28-Day Design Strength	Minimum Cement Sacks/per yd <sup>4</sup>
<b>NON-STRUCTURAL</b>				
1) Lean Concrete (use only where specified)	---	---	---	3.0
2) Slab on Grade Exterior (Walks & Patios)	1" x #4	4" ± 1"	2,500	4.5
<b>STRUCTURAL</b>				
3) Foundation	1" x #4	WCR = .53	3,000	5.0
4) Retaining Walls	1" x #4	WCR = .46	4,000	6.0
5) Drilled Pier	3/4" x #4	WCR = .53	3,000	5.0

1. The tolerance is the maximum deviation allowable without rejection. The mix design shall be based on the nominal value specified and is without water reducing mixtures. Slump to be measured at the end of the hose.
2. The maximum water cement ratio (WCR) is limited at time of placement as noted. No water is to be added on site such that the specified WCR or maximum slump is exceeded without approval of the testing laboratory and the Engineer. Workability is to be achieved utilizing an acceptable mid-range to high range water reducing admixture.
3. Gradation of aggregate is per ACI 318 section 26.4.1.2 and ASTM C33.
4. Minimum cement content includes all cementitious materials.

## 2.07 MIXING CONCRETE

- A. Batch final proportions in accordance with approved mix designs. All adjustments to approved proportions, for whatever reason, shall be reviewed by the Engineer prior to use.
- B. Batch and mix concrete in accordance with ASTM C94, at an established plant. Site mixed concrete will be rejected.
- C. Provide batch and transit equipment adequate for the work. Operate as necessary to provide concrete complying with specified requirements.
- D. Place mixed concrete in forms within 1-1/2 hours from the time of introduction of cement and water into mixer or 300 revolutions of the drum whichever comes first. Use of, re-mixing, and/or tempering mixed concrete older than 1 hour will not be permitted.
- E. Do not add water at the site to concrete mixes with a maximum specified WCR unless the water content at batch time provides for a WCR less than specified and this provision, including the quantity of water which may be added at the site, is specifically noted on the mix design and certification by the mix preparer. See ASTM C94 for additional requirements.

## 2.08 SOURCE QUALITY CONTROL

- A. Services by independent Testing Agency:
  1. Batch Plant Certificates: Obtain the weighmaster's Batch Plant Certificate at arrival of truck at the site. If no batch plant certificate is provided, recommend to the General Contractor that the truckload of concrete be rejected. So note in daily log, along with the location of the load of concrete in the structure if the load is not rejected.
    - a. Laboratory's inspector shall obtain for each transit mixer Batch Plant Certificates to verify mix design quantities and condition upon delivery to the site.

- b. Certificates to include: Date, time, ingredient quantities, water added at plant and on job, total mixer revolutions at time of placement, and time of departure.
- c. Concrete with specified water cement ratio: Add no water on site unless mix design and batch records each show additional water may be added. See ASTM C94 for additional requirements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify lines, levels, and dimensions before proceeding with work of this section.
- B. Verify work of other sections is complete and tested as required before proceeding.

#### **3.02 PREPARATION**

- A. Observation, Inspection and Testing:
  - 1. Engineer: Notify not less than 2 working days before each concrete placement, for observation and review of reinforcing, forms, and other work prior to placement of concrete.
  - 2. Testing Agency: Notify not less than 24 hours before each placement for inspection and testing.
- B. Placement Records: Contractor shall maintain records of time, temperature and date of concrete placement including mix design and location in the structure. Retain records until completion of the contract. Make available for review by Testing Agency and Engineer.
- C. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.
- D. Verify location, position and inclusion of all embedded and concealed items.
- E. Verify installation of vapor retarder under interior slabs on grade, as specified in related section, is complete.
- F. Cleaning and Preparation:
  - 1. Remove loose dirt, mud, standing water, and foreign matter from excavations and cavities.
  - 2. Close cleanout and inspection ports securely.
  - 3. Thoroughly clean reinforcement and other embedded items free from loose rust and foreign matter. Maintain reinforcing securely in place. Do not place concrete on hot reinforcing.
  - 4. Dampen form materials and substrates on which concrete is to be placed at least 1 hour in advance of placing concrete; repeat wetting as necessary to keep surfaces damp. Do not saturate. Do not place concrete on saturated material.
    - a. Thoroughly wet wood forms (except coated plywood), bottom and sides of trenches, adjacent concrete or masonry and reinforcement.
    - b. Concrete slabs on base rock, dampen rock.
    - c. Concrete slabs on vapor retarder, do not wet vapor retarder.
  - 5. Verify that metal forms are clean and free of rust before applying release agent.
  - 6. Thoroughly clean metal decking. Do not place concrete on wet deck surface.
  - 7. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
- G. Drill holes in existing concrete at locations where new concrete is doweled to existing work. Insert steel dowels and prepare connections as detailed.
- H. Do not overcut at existing concrete work to remain. Contractor is responsible for repair/replacement of overcut concrete to the Owner's satisfaction.

### 3.03 PIPES AND CONDUITS IN CONCRETE

- A. Slabs-on-Grade:
  - 1. No pipe or conduit exceeding 1 inch outside diameter shall be embedded within the specified slab thickness except as specifically detailed.
  - 2. Do not stack or abut pipes, maintain 3 inches minimum clearance.
- B. Sleeving and Wrapping:
  - 1. Foundations: Sleeve or wrap all individual pipe penetrations, minimum 1-1/2 inches clear to reinforcing all around.
    - a. Sleeves: PVC. Provide 1 inch minimum clear all around O.D. pipe to I.D sleeve, UNO at ends, fill void space with mastic or plastic bituminous cement.
    - b. Wrapped Vertical Pipes: Provide 1/8 inch nominal sheet foam with three wraps minimum, UNO.
    - c. Wrapped Horizontal Pipes: Provide 1/8 inch nominal sheet foam with eight wraps minimum, UNO.
    - d. Underground Fire Lines 4" and Larger: At sleeves provide 2 inch minimum clear all around O.D. pipe to I.D sleeve. At wrapped pipes, provide 1/8 inch nominal sheet foam with sixteen wraps minimum.
  - 2. Slabs or Curbs: Wrap pipes as described above.
- C. Space groups of pipes/conduits at least 3 sleeve diameters apart, do not interrupt specified concrete and reinforcement.
  - 1. Provide block-outs as detailed when grouping of pipes/conduits in foundation or other structural member prevents spacing as described. Notify Engineer for review of any conditions not conforming to details.
  - 2. Center pipe/conduit penetrations in the depth and/or thickness of foundations.
  - 3. Maximum size of pipe/conduit penetrations shall not exceed the least dimension of concrete divided by 3.
- D. Do not embed pipes/conduits in concrete slabs on metal deck.
- E. Provide the following at pipes/conduits detailed to be embedded in a concrete beam, wall or column:
  - 1. Place as near as possible to center of member with reinforcing as specified on each side.
  - 2. Where reinforcing is located near or at center of member, place pipe or conduit 1 inch minimum clear from reinforcing and provide #3 at 12 inches on center perpendicular to the pipe/conduit. Reinforcing to extend 12 inches minimum past pipe/conduit each side.
  - 3. Maintain 3/4 inch clear minimum from added reinforcing to face of concrete where not exposed to weather and 1-1/2 inches clear where exposed to weather.
  - 4. Space embedded items (groups of pipe/conduit, junction boxes or other elements) minimum 3 inches apart.
  - 5. Provide reinforcing in walls, beams, columns as detailed for groups of pipe/conduit. Provide minimum replacement reinforcement of same size and number for interrupted or displaced reinforcement for the full height, length, width of the wall, beam, and/or column on each side of the "effective opening."

### 3.04 CONCRETE PLACEMENT

- A. Transporting:
  - 1. Provide clean, well-maintained equipment of sufficient quantity and capacity to execute the work and produce concrete of quality specified.
  - 2. Handle and transport concrete from mixer to final deposit location as rapidly as practicable. Prevent separation or loss of ingredients.



- B. Perform concrete placement by methods which will not puncture, damage or disturb vapor retarder membrane. Repair all damage to vapor retarder membrane before covering.
- C. Placement - General: Placement, once started, shall be carried on as a continuous operation until section of approved size and shape is completed. Provide construction joints as detailed on the drawings. Engineer's written approval required for all deviations.
  - 1. Deposition:
    - a. Deposit concrete to maintain an approximately horizontal plastic surface until the completion of the unit placement.
    - b. Deposit as neatly as practicable in final position, minimize re-handling or flow.
    - c. Do not drop concrete freely where reinforcing bars, embeds, or obstructions occur that may cause segregation. Provide spouts, elephant trunks, or other means to prevent segregation during placement.
  - 2. Depth: Layered placement in columns and walls shall not exceed ten feet vertical depth.
    - a. Place concrete in minimum 32 inch horizontal lifts.
    - b. Schedule placement to ensure that concrete will not take initial set before placement of next lift.
    - c. No horizontal cold joints are allowed in columns or walls.
  - 3. Progress Cleaning: Remove all concrete spilled on forms or reinforcing steel in portions of structure not immediately concreted. Remove completely before concrete sets.
  - 4. Interruptions: Shut down placement operations and dispose of all remaining mixed concrete and concrete in hoppers or mixers following all interruption in placement longer than 60 minutes.
    - a. If such interruption occurs, provide new or relocate existing construction joints as directed by Engineer.
    - b. Cut concrete back to the designated line, cleaning forms and reinforcing as herein specified.
    - c. Prepare for resumption of placement as for new unit when reason for interruption is resolved.
- D. Consolidation:
  - 1. Consolidate all concrete thoroughly during placement with high-speed mechanical vibrators and other suitable tools. Perform manual spading and tamping to work around reinforcement, embedded fixtures, and into corners of formwork as required to obtain thorough compaction.
    - a. Provide vibrators with sufficient amplitude for adequate consolidation.
    - b. Use mechanical vibrators at each point of concrete placement.
    - c. Keep additional spare vibrators, in addition to those required for use, at the site for standby service in case of equipment failure.
  - 2. Consolidate each layer of concrete as placed.
    - a. Insert vibrators vertically at points 18 to 30 inches apart; work into top area of previously placed layer to reconsolidate, slowly withdraw vibrator to surface.
    - b. Avoid contact of vibrator heads with formwork surfaces.
    - c. Systematically double back and reconsolidate wherever possible. Consolidate as required to provide concrete of maximum density with minimized honeycomb.
- E. Unacceptable Materials:
  - 1. Do not place concrete that has started to set or stiffen. Dispose of these materials.
  - 2. Do not add water on site to concrete except as specified in the approved mix design, see PART 2 above.
- F. Protection of installed work:
  - 1. Do not introduce any foreign material into any specified drainage, piping or duct systems.
  - 2. Contractor shall bear all costs of work required to repair or clean affected work as a result of failure to comply with this requirement.

- A. Structural Joints (Construction/Cold Joints):
  - 1. Locate joints only where shown, or as approved.
  - 2. Review Required: Joints not indicated on the plans shall be located to meet the minimum requirements below, shall not impair the strength of the structure and shall be submitted to Engineer for review prior to placement of concrete.
    - a. Indicate proposed location(s) of construction/cold/expansion joints on shop drawing submittals for review prior to placing concrete.
  - 3. Clean and roughen all surfaces of previously placed concrete at construction joints by washing and sandblasting to expose aggregate to 1/4 inch amplitude.
  - 4. Slabs-On-Grade: Maximum Length of continuous placement shall not exceed 60 feet without special review by the Engineer. Alternate or stagger placement sections.
  - 5. Foundations: Maximum Length of continuous placement shall not exceed 200 foot increments. Provide "keyed" shut-off locations made up with form boards. Extend reinforcing one lap length or more through shut-off.
    - a. All reinforcement shall be continuous through construction/cold joint, lapping to adjacent reinforcing in future placement.
  - 6. Horizontal Construction Joints: Place 2 inch slurry (specified concrete mix less coarse aggregate) at beginning of pour at the bottom of walls unless a prior review of a mock-up section demonstrates that segregation of aggregate will not occur.
- B. Expansion/Construction Joints (Dowel Joints and Control Joints):
  - 1. Exterior Concrete Paving (walkways, patios) and other non-structural concrete flatwork at grade:
    - a. Expansion/ construction joints: Provide a 2 inch deep troweled groove or asphalt impregnated joint material embedded 50 percent of the slab depth at 12 feet on center, maximum.
    - b. Proportions: Place no section with a length larger than two times width. Additionally, place joints at all inside corners and at all intersections with other work.
- C. Joint Types:
  - 1. Dowel Joint: A keyed joint with smooth dowels passing through to allow unrestricted movement due to contraction and expansion. Joints are as specified on the drawings.
  - 2. Control Joint(s): Shrinkage crack control joints may be of the following types when shown on the drawings. Install joints in a straight line between end points with edges finished appropriate to type. Depth shall be 25% of the slab thickness, unless noted otherwise. Fill joints with sealant as shown on the drawings or as required by related sections.
    - a. 1/4 inch wide troweled joint.
    - b. Keyed joint: Only at locations where concealed by other finishes.
    - c. Masonite Strip, 1/8 inch: Only at locations where concealed by other finishes.
    - d. Saw Cut, 1/8 inch: Must be performed within eight hours of completion of finishing. Do not make saw cuts if aggregate separates from cement paste during cutting operation. Prevent marring of surface finish. Fill with flexible sealant.

### 3.06 VAPOR RETARDER

- A. Vapor Retarder Installation: Install as specified in PART 2, ASTM E1643, and per manufacturer's recommendations including taping and lapping of seams, sealing of penetrations, and repair of damage. Do not extend vapor retarder below footings.

### 3.07 FLATWORK

- A. General Requirements for All Concrete Formed & Finished Flat:
  - 1. Edge Forms and Screeds: Set accurately to produce indicated design elevations and contours in the finished surface, edge forms sufficiently strong to support screed type proposed.

2. Jointing: Located and detailed as indicated.
3. Consolidation: Concrete in slabs shall be thoroughly consolidated.

### 3.08 FORMED SURFACES

- A. Form all concrete members level and plumb, except as specifically indicated. Comply with tolerances specified in ACI 318 Section 26.11, ACI 301 Section 2, and this specification, except that maximum permissible deviation is 1/4 inch end-to-end for any single member.
- B. Cambers: Provide all cambers indicated in the formwork construction. Set screeds to produce specified cambers in the finished concrete.

### 3.09 CONCRETE FINISHES

- A. Flatwork Finishing:
  1. Perform with experienced operators.
  2. Finish surfaces monolithically. Establish uniform slopes or level grades as indicated. Maintain full design thickness.
  3. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains as indicated on drawings.
  4. Flatwork Finish Types:
    - a. Wood Float Finish: Surfaces to receive quarry tile, ceramic tile, or cementitious terrazzo with full bed setting system, or wood frame for raised finished floors.
    - b. Steel Trowel Finish: Surfaces to receive carpeting, resilient flooring, seamless flooring, thin set terrazzo, thin set tile or similar finishes specified in related sections. Trowel twice, minimum.
    - c. Broom Texture Finish: Exterior surfaces as indicated or for which no other finish is indicated. Finish as for steel trowel finish, except immediately following first troweling, (depending on conditions of concrete and nature of finish required) provide uniform surfaces texture using a medium or coarse fiber broom.
- B. Other Concrete: Provide as required to achieve appearance indicated on Structural and Landscape Architectural drawings and related sections.
  1. Repair surface defects, including tie holes, immediately after removing formwork.
  2. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
  3. Exposed Form Finish: Finish concrete to match forms. Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
    - a. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
    - b. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
    - c. Cork Floated Finish: Immediately after form removal, apply grout with trowel or firm rubber float; compress grout with low-speed grinder, and apply final texture with cork float.
  4. Intermediate joint and score marks and edges: Tool smooth and flush unless otherwise indicated or as directed by the Landscape Architect.
  5. Use steel tools of standard patterns and as required to achieve details shown or specified. All exposed corners not specified to be chamfered shall have radiused edges.

### 3.10 TOLERANCES

- A. Minimum Flatwork Tolerances: Measure flatness of slabs within 48 hours after slab installation in accordance with ACI 302.1R and ASTM E1155 and to achieve the following FF and FL tolerances:
  - 1. Exterior surfaces: 1/8 inch minimum per foot where sloped to drain. Level otherwise. FF20 and FL15.
  - 2. Interior surfaces not otherwise shown or required: Level throughout. FF25 and FL20
  - 3. Interior surfaces required to be sloped for drainage: 1/8 inch in 10 ft.
  - 4. Finish concrete to achieve the following tolerances:
    - a. Under Glazed Tile on Setting Bed: FF30 and FL20.
    - b. Under Resilient Finishes: FF35 and FL25.
    - c. Flooring manufacturer and pertinent section of Division 9.
- B. Formed Surface Tolerances:
  - 1. Permanently Exposed Joints and Surfaces: Provide maximum differential height within two feet of, and across construction joints of 1/16 inch.
  - 2. Vertical Elevations: Elevation of surfaces shall be as shown or approved.

### 3.11 SEPARATE FLOOR TOPPINGS

- A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.
- B. Place required dividers, edge strips, reinforcing, and other items to be cast in.
- C. Apply bonding agent to substrate in accordance with manufacturer's instructions.
- D. Apply sand and cement slurry coat on base course, immediately prior to placing toppings.
- E. Place concrete floor toppings to required lines and levels. Place topping in checkerboard panels not to exceed 20 feet in either direction
- F. Screed toppings level, maintaining surface tolerances per above.

### 3.12 CONCRETE CURING

- A. Curing - General: Cure in accordance with ACI 308. Maintain concrete water content for proper hydration and minimize temperature variations. Begin curing immediately following finishing.
- B. Protection During Curing: Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. The General Contractor is responsible for the protection of the finished slab from damage.
  - 1. Avoid foot traffic on concrete for minimum of 24-hours after placement.
  - 2. Protect concrete from sun and rain.
  - 3. Maintain concrete temperature at or above 50 degrees F. during the first 7 days after placement. See Article ENVIRONMENTAL REQUIREMENTS.
  - 4. Do not subject concrete to design loads until concrete is completely cured, and until concrete has attained its full specified 28-day compressive strength or until 21 days after placement, whichever is longer.
  - 5. Protect concrete during and after curing from damage during subsequent building construction operations. See Article PROTECTION.
- C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
  - 1. Normal concrete: Not less than 7 days.
  - 2. High early strength concrete: Not less than 4 days.
- D. Begin curing immediately following finishing.

- E. Surfaces Not in Contact with Forms:
  - 1. Start initial curing as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than 3 days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
  - 2. Begin final curing after initial curing but before surface is dry.
    - a. Moisture-retaining cover: Seal in place with waterproof tape or adhesive.
    - b. Curing compound: Apply in two coats at right angles, using application rate recommended by manufacturer.
- F. Flatwork on Grade: Cure by one of the following methods:
  - 1. Water Cure (Ponding): Maintain 100 percent coverage of water over floor slab areas, continuously for minimum 7 calendar days.
  - 2. Spraying: Spray water over floor slab areas and maintain wet for 7 days.
  - 3. Moisture-Retaining Film or Paper: Lap strips not less than 6 inches and seal with waterproof tape or adhesive; extend beyond slab or paving perimeters minimum 6 inches and secure at edges; maintain in place for minimum 7 days.
  - 4. Absorptive Moisture-Retaining Covering: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides and extend beyond slab or paving perimeters 6 inches minimum; maintain in place for minimum 7 days.
  - 5. Liquid Membrane-forming Curing Compound: Provide only when subsequent concrete treatments or finish flooring specified in related sections will not be affected by cure/sealer. Apply curing compound in accordance with manufacturer's instructions at the maximum recommended application rate in two coats, with second coat applied at right angles to first.
- G. Formed Concrete Members: Cure by moist curing with forms in place for full curing period.
  - 1. Protect free-standing elements from temperature extremes.
  - 2. Maintain forms tight for minimum 7 days. Maintain exposed surfaces continuously damp and completely covered by sheet materials thereafter.
  - 3. Maintain all shoring in place. Refer to related sections specifying formwork.
  - 4. Membrane Curing Compound: Apply compound in accordance with manufacturer's instructions in one coat.
- H. Foundations: Apply curing compound immediately after floating.

### **3.13 CONCRETE HARDENER**

- A. Apply hardener to all floor slabs not receiving other finishes after 30 days minimum curing. Clean slabs of non-compatible cure/sealers or other foreign material(s) and apply in strict accordance with the manufacturer's directions.

### **3.14 GROUTING AND DRY PACK**

- A. Set steel plates on concrete or masonry with high strength grout bed, completely fill all voids; thoroughly compact in place. See Section 05 1200 or 05 1100.
- B. Bolts or inserts dry packed or grouted in place shall cure for minimum 7 days before tensioning.

### **3.15 FIELD QUALITY CONTROL**

- A. Testing and Inspections by Independent Testing Agency: Provided verification and inspection of concrete per CBC Table 1705.3. Provide written reports for to Engineer, Landscape Architect, Contractor and Building Official for the following tests and inspections:
- B. Testing & Inspection: Provide periodic inspection of reinforcing steel. Provide continuous inspection during placement of structural class concrete, 3000 psi or more. Non-structural class

concrete with a design strength of 2500 psi or less to have periodic inspection on a 150 cubic yard basis as required to assure conformance.

1. Provide periodic inspection of bolts in concrete prior to and during placement where so noted on the construction documents.
2. Structural Concrete Cylinder Tests: Perform in accordance with ASTM C31.
  - a. Take four standard 6 inch x 12 inch (or five 4 inch x 8 inch) cylinder specimens on the site, of each class of concrete as specified in PART 2, not less than once a day or for each 150 cubic yards or 5000 sq ft or fraction thereof placed each day.
  - b. Record the location of each concrete batch in the building in a log and also note on each specimen.
  - c. Perform standard compression test of cylinders in accordance with ASTM C39, one at 7 days and two (three for 4x8 cylinders) at 28 days.
  - d. Hold fourth (fifth) cylinder untested until specified concrete strengths are attained.
3. Structural Concrete Slump Test and Air Tests: Perform in accordance with ASTM D143 and C231 or C173 at the time of taking test cylinders, and/or at one-hour intervals during concrete placing.
4. Measure and record concrete temperature upon arrival of transit mixers and when taking specimens. Note weather conditions and temperature.
5. Propose adjustments to reviewed mix designs for Engineer's review to account for variations in site or weather conditions, or other factors as appropriate.
6. Water Vapor Transmission Tests: Floors receiving floor finishes specified in related sections will be tested prior to installation of flooring systems. Refer to sections specifying floor finishes for related requirements.

C. Services by Contractor:

1. Rejection of Concrete Materials: Do not use the following without prior written approval of the Engineer;
  - a. Materials without batch plant certificates.
  - b. Materials not conforming to the requirements of these specifications.

### 3.16 ADJUSTING

- A. Inspect all concrete surfaces immediately upon formwork removal. Notify Engineer of identified minor defects. Repair all minor defects as directed.
- B. Surface and Finish Defects: Repair as directed by the Landscape Architect/Engineer, at no added expense to the Owner. Repairs include all necessary materials; reinforcement grouts, dry pack, admixtures, epoxy and aggregates to perform required repair.
  1. Repair minor defective surface defects by use of drypack and surface grinding. Specific written approval of Landscape Architect/Engineer is required. Submit proposed patching mixture and methods for approval prior to commencing work.
  2. Slabs-on-Grade: Review for "curled" slab edges and shrinkage cracks prior to installation of other floor finishes. Grind curled edges flush, fill cracks of 1/16 inch and greater with cementitious grout.
  3. Grind high spots, fins or protrusions caused by formwork; Fill-in pour joints, voids, rock pockets, tie holes and other void not impairing structural strength. Provide surfaces flush with surrounding concrete.

### 3.17 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required compressive strength, lines, details, dimensions, tolerances, finishes or specified requirements; as determined by the Landscape Architect/Engineer.

- B. Repair or replacement of defective concrete will be determined by the Architect/Engineer who may order additional testing and inspection at their option. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- C. Specific Defects:
  - 1. "Low-Strength"; Concrete Not Meeting Specified Compressive Strength after 28 days:
    - a. Concrete with less than 25% Fly Ash as cementitious material: Test remaining cylinder(s) at 56 days. If strength requirements are met, concrete strength is acceptable.
    - b. Concrete with 25% or more Fly Ash as cementitious material: Test remaining cylinder(s) at 70 days. If strength requirements are met, concrete strength is acceptable.
  - 2. Excessive Shrinkage, Cracking, Cracking, Cracking or Curling; Defective Finish: Remove and replace if repair to acceptable condition is not feasible.
  - 3. Lines, Details, Dimensions, Tolerances: Remove and replace if repair to acceptable condition is not feasible.
  - 4. Slab sections not meeting specified tolerances for trueness/flatness or lines/levels: Remove and replace unless otherwise directed by the Landscape Architect/Engineer. Minimum area for removal: Fifteen square feet area unless directed otherwise by the Landscape Architect/Engineer.
  - 5. Defective work affecting the strength of the structure or the appearance: Complete removal and replacement of defective concrete, as directed by the Landscape Architect/Engineer.

### 3.18 CLEANING

- A. Maintain site free of debris and rubbish. Remove all materials and apparatus from the premises and streets at completion of work. Remove all drippings; leave the entire work clean and free of debris.
- B. Slabs to Receive Floor Finishes Specified in other sections: Remove non-compatible cure/sealers or other foreign material(s) which may affect bonding of subsequent finishes. Leave in condition to receive work of related sections.

### 3.19 PROTECTION

- A. Protect completed work from damage until project is complete and accepted by Owner.
- B. Construction Loads: Submit engineering analysis for equipment loads (including all carried loads) specified in article submittals.
- C. Keep finished areas free from all equipment traffic for a minimum of 4 additional days following attainment of design strength and completion of curing.
- D. Protection of Drainage Systems:
  - 1. Care shall be taken not to introduce any foreign material into any specified drainage, piping or duct system.
  - 2. Cost of work to repair or clean drainage system as a result of failure to comply with this requirement will be back charged to the contractor.
- E. Cover traffic areas with plywood sheets or other protective devices; maintain protection in place and in good repair for as long as necessary to protect against damage by subsequent construction operations.

**END OF SECTION**

## SECTION 04 2000

### CONCRETE UNIT MASONRY

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes: All labor, material and equipment and perform all operations required to complete all masonry work as indicated on the drawings and specified.
- B. Additional work included in this section: Provision of concrete grout and installation of items provided by other trades that are embedded in and/or attached to masonry work; providing forms at block-outs and formed concrete grout.
- C. Related Sections:
  - 1. General Conditions and Special Provisions.
  - 2. Pertinent sections of other Divisions specifying formwork, reinforcement, concrete, masonry, steel, and rough carpentry.
  - 3. Pertinent Sections of other Divisions specifying work to be embedded in concrete or work penetrating concrete work.

##### 1.02 REFERENCES AND STANDARDS

- A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC): Chapter 19 Concrete, Chapter 21 Masonry
- B. TMS 402 / ACI 530 / ASCE 5 "Building Code Requirements for Masonry Structures".
- C. TMS 602 / ACI 530.1 / ASCE 6 "Specification for Masonry Structures".
- D. ASTM A615 "Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement".
- E. ASTM C90 "Load-Bearing Concrete Masonry Units".
- F. ASTM C144 "Aggregate for Masonry Mortar".
- G. ASTM C270 "Mortar for Unit Masonry".
- H. ASTM C404 "Aggregates for Masonry Grout".
- I. ASTM C476 "Grout for Masonry".

##### 1.03 SUBMITTALS

- A. The General Contractor shall review and approve submittals prior to submittal to the Engineer. Submittals that do not meet these requirements will be returned for correction without review.
- B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents.



- C. Product Data: Submit manufacturer's product data, specifications, location and installation instructions for proprietary materials and reinforcement accessories. Provide samples of these items upon request.
- D. Contractor Submittals:
  - 1. Mix design for all grout and mortar, prepared by a qualified testing laboratory, per TMS 602 section 1.5. Show conformance of mix to proportion specification of ASTM C270 for mortar and ASTM C476 for grout. Alternatively, provide test results and show conformance of mix to property specification of ASTM C270 for mortar and ASTM C476 for grout. Mix shall conform to all requirements herein.
  - 2. Material certificates for all materials used in mixes.
  - 3. Submit shop drawings for all shapes and sizes of concrete unit masonry shown and scheduled on the drawings. Submit shop drawings detailing and locating all masonry reinforcement.
  - 4. Certificate of compliance and test data by concrete unit masonry supplier showing conformance to specified material strengths and properties.
  - 5. Samples: Laid up sections of masonry walls for the Landscape Architect's approval of size, texture and color of block, mortar and joint pattern.
  - 6. Layout of vertical control joints in masonry walls coordinated with Structural and Landscape Architectural drawings.
  - 7. Submit cold and/or hot weather construction procedures when ambient temperature is below 40°F or above 90°F. See PART 3.

#### **1.04 QUALITY ASSURANCE**

- A. For requirements of the Authority Having Jurisdiction, refer to CBC Chapter 17.
- B. All tests shall be performed by an approved Testing Agency.
- C. Testing and Inspection: Tests and inspections performed by approved Testing Agency are specified below in Articles SOURCE QUALITY CONTROL and FIELD QUALITY CONTROL and the Testing & Inspection Form.
- D. General: Provide reports to Engineer and Authorities Having Jurisdiction (AHJ) indicating results of tests and inspections.
- E. Concrete Unit Masonry
  - 1. All testing of concrete unit masonry by the approved Testing Agency shall comply with the requirements of CBC Chapters 17 and 21.
  - 2. Approved Testing Agency shall provide Level B Quality Assurance Program per TMS 602 and CBC Chapter 17 by an approved inspector of masonry construction.
- F. Contractor shall provide adequate materials for sampling and shall patch core holes made by the approved Testing Agency using non-shrink, high-strength grout.

#### **1.05 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Deliver and store packaged material in original containers with seals unbroken and labels intact until time of use.
- B. Unload masonry units carefully and store on raised platform protected from weather.

- C. Protect cementitious materials against exposure to moisture. Use of cementitious or other materials that have become caked and hardened from absorption of moisture will not be permitted.

#### 1.06 JOB CONDITIONS

- A. Environmental Conditions: Do not place concrete unit masonry when temperature is below 40 degrees Fahrenheit or above 90 degrees Fahrenheit unless the Contractor provides means for preventing damage due to freezing or high-temperatures before and after placement and the Engineer approves. See Section PART 3.
- B. Protection: Protect surrounding work as required against damage from masonry work. Clean satisfactorily or otherwise correct damage to surrounding work resulting from masonry work. See PART 3.

#### 1.07 SCHEDULING AND SEQUENCING

- A. Organize the work and employ shop and field crew(s) of sufficient size to minimize inspections by the approved Testing Agency.
- B. Provide schedule and sequence information to approved Testing Agency in writing upon request. Update information as work progresses.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Hollow Load-Bearing Concrete Masonry Units:
  - 1. General: All concrete masonry units shall be double open end wherever possible (single open end otherwise).
  - 2. Concrete masonry units shall be medium or light weight and shall conform to ASTM C90. Minimum compressive strength shall be 2000psi.
  - 3. Concrete masonry units exposed to view shall be 8x8x16 unless otherwise noted on the construction drawings. Concrete masonry caps shall be 2x8x16 (nominal) standard grey unless otherwise noted on the construction drawings.
- B. Portland Cement: ASTM C150, Type II, low alkali
- C. Aggregates
  - 1. For Mortar: ASTM C144.
  - 2. For Grout: ASTM C404.
- D. Hydrated Lime: ASTM C207, Type S
- E. Quick Lime: ASTM C5, high calcium
- F. Reinforcing Steel: ASTM A615 (or A706) grade 60.
- G. Water: Clean and potable, free from impurities detrimental to mortar and grout.
- H. Grout Aid: "Grout Aid" by Sika Corporation.

- I. High Strength Grout: Conform to CRD-C621 and ASTM C1107. Non-shrink, non-ferrous, minimum compressive strength at 28 days to be 7000 psi (when placed in a fluid state). Meet or exceed BASF "Master Flow 928".
- J. Pre-molded Control Joint: ASTM D2000 M2AA-805 rubber shear keys with a minimum durometer hardness of 80 or ASTM D2287 Type PVC 654-4 PVC shear keys with a minimum durometer hardness of 85.
- K. Flexible Sealant: ASTM C920.
- L. Mortar Color: Submit to Landscape Architect for approval.

## 2.02 FABRICATION

- A. Reinforcement: Conform to requirements of Section 03 2000, Concrete Reinforcing.

## 2.03 MIXES AND MIXING

- A. General Mixing Requirements:
  - 1. Measure materials accurately. Shovel measurements will not be permitted.
  - 2. Use mechanical mixer of at least one sack capacity.
  - 3. Mix for minimum of three minutes and in no case less than time required for securing uniform mass and workable consistency.
  - 4. Completely empty drum before charging succeeding batch of materials.
  - 5. Exercise extreme care in measuring ingredients for partial batches.
- B. Mortar
  - 1. Type M or S per ASTM C270. Minimum compressive strength at 28 days: 1800 psi (Type S), 2500 psi (Type M). Admixtures not allowed. Otherwise conform to CBC Section 2103.2.1.
  - 2. Use and place mortar in final position within 2-1/2 hours after mixing. Mortars that have stiffened due to evaporation of water may be retempered with water as frequently as required to restore required consistency during this time period.
  - 3. Provide integrally colored mortar to match block. Colors to be submitted to Landscape Architect for approval. Add mortar colors in accordance with manufacturer's recommendations. Ensure uniformity of mix and coloration.
- C. Concrete Grout
  - 1. General:
    - a. Six sacks (94 pounds per sack) of cement per cubic yard minimum. Concrete masonry grout compressive strength to attain 2000 psi minimum after 28 days
    - b. One pound "Sika Grout Aid" per sack of cement (6 pounds maximum per cubic yard).
    - c. Slump: 8 to 11 inches.
  - 2. Otherwise conform to CBC Section 2103.3.

## 2.04 SOURCE QUALITY CONTROL

- A. An approved Testing Agency will perform source quality control tests and submit reports, as specified in CBC Chapter 17 and 21.
- B. Test materials per CBC Chapter 17 and CBC Section 2105.1 unit strength method or prism test method.

## **PART 3 EXECUTION**

### **3.01 INSPECTION BY CONTRACTOR**

- A. Examine areas to receive masonry and verify following per TMS 602:
  - 1. Foundation surface is level to permit bed joint within range of 1/4 to 3/4-inch.
  - 2. Edge is true to line to permit projection of masonry to less than 1/4-inch.
  - 3. Projecting dowels are free from loose scale, dirt, concrete or other bond-inhibiting substances and properly located.
  - 4. Built-in items are properly sized and located.
- B. Do not begin work before unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Clean concrete surfaces to receive masonry. Remove laitance or other foreign material lodged in surface by sandblasting or other means as required. Roughen foundation bed to expose aggregate; remove loose particles and saturate before laying units.
- B. Ensure masonry units are clean and free from dust, dirt or other foreign materials before laying.

### **3.03 REINFORCEMENT**

- A. Place bars where noted in accordance with drawings and SP-66 "ACI Detailing Manual". Do not disturb after start of masonry placement.
- B. Splice bars with dowels cast in concrete; lap bars per drawings. Bars shall not be "stabbed" after grout placement. All reinforcing shall be tied in place with wire prior to grout placement. The use of approved bar spacers is acceptable.

### **3.04 PLACEMENT**

- A. General Requirements
  - 1. Masonry construction shall conform with TMS 602.
  - 2. Ensure masonry units are sound, clean and free of cracking at time of placement.
  - 3. Accurately cut and fit units as required using masonry saws to accommodate work of other sections.
  - 4. Lay masonry units plumb, true to line with level courses accurately placed. Maximum tolerance 1/4" in 8'-0".
  - 5. Adjust unit to final position while mortar is soft and plastic.
  - 6. Align vertical cells accurately.
  - 7. Remove units disturbed after stiffening of mortar, clean joints and relay unit with fresh mortar.
  - 8. Do not attach construction supports to walls.
  - 9. Install anchor bolts and other embedded items accurately as work progresses. Use templates as necessary to meet required tolerance of other's work.
  - 10. Brace walls adequately until supporting structure is complete.
  - 11. Do not place conduit, pipes, wire, etc. in cells containing reinforcing steel.
- B. Joints:
  - 1. Fill joints; ensure full coverage of face shells in both horizontal and vertical joints and on webs.

2. Tool (concave) and finish joints as specified to achieve solid, smooth, watertight compacted joint.
  3. Immediately fill holes made by line pin with mortar when pin is withdrawn.
  4. Remove surplus mortar from joints.
  5. Provide vertical control joints at 1.5 times the wall height (but not greater than 25'-0") and as detailed on the structural drawings.
- C. Cold Weather Requirements
1. When ambient temperature is below 40 degrees Fahrenheit, submit cold weather protection plan per TMS 602 Section 1.8C. Ensure reinforcing, masonry units, etc. contacting mortar and grout are free of frost.
- D. Hot Weather Requirements
1. When ambient temperature exceeds 90 degrees, submit hot weather protection plan per TMS 602 Section 1.8D.
- E. Protection
1. Protect face materials against staining.
  2. Remove misplaced grout or mortar immediately.
  3. Protect sills, ledges, off-sets and similar items from mortar drippings or other damage during construction.
  4. Cover top of unfinished work to protect it from weather and debris.
- F. Concrete Masonry Units
1. Bond: Running bond unless specifically noted otherwise.
  2. Joint Thickness: 3/8-inch both vertically and horizontally.
  3. Joint Treatment:
    - a. Typical exterior and interior walls; tool joint for weather tightness.
    - b. Construction joints to be sealed with joint sealant or high strength grout as noted on the drawings.
  4. Use proper units to provide for doors, bond beams lintels, etc. in order to minimize cutting.
  5. Do not wet units.
  6. Align vertical cells to provide continuous, unobstructed opening for grouting.
  7. Corners: Provide standard masonry bond by overlapping units.
  8. Provide mechanical cleanout methods as needed. To facilitate cleanout where pour height exceeds 5 feet 4 inches, provide inverted bond beam units at the bottom of each pour and provide cleanouts in these courses as necessary, not exceeding 32 inches on center. Locate cleanouts to minimize visual impact. Verify with Engineer.

### 3.05 GROUTING

- A. General Requirements
1. Conform to requirements of TMS 602.
  2. A pour is defined as the height of grout to be placed in one day. The height of masonry unit placement at the time of grouting shall not exceed the pour height. Masonry shall have cured minimum 4 hours before grout placement. Maximum pour height is 24 feet, or less, as determined by the contractor. Maximum individual lift height is 5 feet 4 inches, or less, as determined by the contractor. Allow time between lifts for initial water loss of grout to occur. Do not allow grout to cure between lifts. Contractor is responsible for adequate cleaning and prevention of blowouts.
  3. Grout void between wythes and cells of concrete block.
  4. Ensure grout flows into voids and completely surrounds reinforcing steel.

5. Stop grout approximately one and a half inches below top of last course except at top course without a concrete cap.
6. Grout from a non-exposed face of masonry wherever possible.
7. Where necessary to stop longitudinal run, provide suitable dam to retain grout in place.
8. Clean all cells of pour space prior to grouting. Remove all loose mortar, etc.
9. Consolidate grout with a mechanical vibrator with a 3/4" head.
10. Slushing with mortar will not be permitted.
11. Use grout pump, hopper or bucket to place grout.
12. Do not wet down grout spaces prior to grouting.

### **3.06 FIELD QUALITY CONTROL**

- A. The approved Testing Agency will perform field quality control tests, as specified in CBC Chapters 17 and 21.
- B. The approved Testing Agency will provide inspections per the requirements of CBC Section 1705.4.
- C. Concrete masonry shall have an assumed 28 day prism strength of 2000psi.

### **3.07 POINTING AND CLEANING**

- A. Point holes or defective mortar joints upon completion of work; where necessary, cut out and repoint defective joints.
- B. At end of workday, fiber brush new surfaces to remove mortar splashes, clean with mild detergent or enzymes, and rinse with clean water.
- C. When ordinary methods are not adequate, employ sandblasting, chipping or other special methods.
- D. Do not use acid solution to remove green stain or efflorescence resulting from vanadium salts. Follow recommendations of manufacturer for removal of such stains.
- E. Clean all surfaces upon completion of erection, leave free of grime and dirt. Remove unused materials, tools, equipment and debris from the premises and leave surfaces broomed clean.
- F. Protect work from damage by subsequent operations.

### **3.08 ADJUSTING**

- A. Replace all defective work at Contractor's expense.
- B. Replace defective or damaged work with conforming work.
- C. Engineer shall review all proposals for the repair or replacement of damaged, defective, or missing work.
- D. Contractor to pay expenses incurred by Owner for Landscape Architect/Engineer's costs for (re-) design and obtaining approvals of Authorities Having Jurisdiction necessitated by incomplete, inefficiently scheduled, improperly performed, defective or nonconforming work.

- E. Pay expenses due to re-testing and re-inspection necessitated by incomplete, inefficiently scheduled, improperly performed, defective or nonconforming work.

**END OF SECTION**

## SECTION 05 5200

### METAL FABRICATIONS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. The Contract Documents for this project are complementary and applicable to this Section of the Specifications.
- B. Work Included: Furnish all labor, materials, equipment and services necessary to provide metal fabrications complete in place, as shown on the Plans and/or specified herein.
- C. Related Work:
  - 1. Section 03 3000 Cast-in-Place Concrete
  - 2. Section 32 1600: Curb, Gutter and Sidewalks

##### 1.02 REFERENCES

- A. Code: Uniform Building Code, most recent Edition. Trade Standards:
  - 1. AWS A1.06 Code of Arc and Gas Welding
  - 2. AWS D1.1 Code of Standard Practice
  - 3. ASTM A36 – Structural Steel
  - 4. ASTM A53 – Hot-dipped, zinc-coated welded and seamless steel pipe
  - 5. ASTM A386 – Zinc-coating (hot-dip) on Assembled Steel Products
  - 6. ASTM A500, Gr. C. – HSS (Hollow Structural Section) Square
  - 7. Anchor Bolts/Rods, Nuts, and Washers: ASTM F1554 Gr. 36 or 55 with ASTM A563 Grade A nuts and ASTM F436 Type 1 washers
- B. Design Loadings: Fabricate to meet OSHA requirements to withstand a live load of at least 200 pounds applied in any direction at any point on the fabrication.

##### 1.03 SUBMITTALS

- A. Submittals shall be in compliance the General Conditions and Special Provisions.
- B. Shop Drawings: Submit complete shop drawings for all metal fabrications, finish, paint color and painting methods.
- C. Submit samples of all metal fabrications, finish and paint for review and approval by the Engineer.

##### 1.04 COORDINATION

- A. Review all Plans for metal fabrications.
- B. Verify conditions and dimensions.
- C. Deliver items set in concrete in sufficient time for proper embedment.
- D. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordination of installation.



## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. All materials shall be as shown on the Plans, or specified herein.
- B. All metal fabrications shall be free of fins, abrasions, rough or sharp edges, and other surface defects and shall not be kinked, twisted or bent. If straightening is necessary, it shall be done by methods approved by the Engineer. Kinks, twists, or bends may be cause for rejection of the metal fabrication.
- C. Grout shall be Morgan Non-Shrink Grout - Rapid Set 45, or Engineer approved equal.

### **2.02 FABRICATION**

- A. Comply with AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings," Latest Edition.
- B. Verify dimensions on site prior to fabrication.
- C. Fabricate items with joints tightly fitted and secured.
- D. Fit and shop assemble in largest practical sections, for delivery to site.
- E. Grind exposed welds flush and smooth with adjacent finished surface. Ease exposed edges to small uniform radius.
- F. Make exposed joints butt tight, flush and hairline.
- G. Make provisions to connect with or receive work of other trades.
- H. Where possible conceal connections, otherwise, make countersinks for concealment after fabrication.
- I. On finished surfaces exposed to view, grind welds smooth and flush with base material; re-weld to fill holes, putty is not permitted.

### **2.03 FINISH**

- A. Cleaning: Thoroughly clean all mill scale, rust, dirt, grease and other foreign matter from ferrous metal prior to any galvanizing, hot-phosphate treatment or painting.
  - 1. Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2, "Hand Tool Cleaning," or SSPC SP-3, "Power Tool Cleaning," or SSPC SP-7, "Brush-Off Blast Cleaning."
  - 2. Remove oil, grease and similar contaminants in accordance with SSPC SP-1, "Solvent Cleaning."
- B. Galvanizing: Provide zinc coating for all exposed exterior items and items embedded in concrete after fabrication, complying with the following:
  - 1. ASTM A153 for galvanizing iron and steel hardware.
  - 2. ASTM A123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strips 1/8" thick and heavier.
  - 3. ASTM A386 for galvanizing assembled steel products.
- C. Powder coating: After fabrication and galvanizing, the fabrications shall be powder coated where noted on the Plans, per industry standards for powder coating over galvanized metal.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install items plumb and level, free from distortion or defects.
- B. Perform field welding in accordance with AWS D1.1.
- C. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of metal fabrications. Set work in location, with proper alignment and elevation, plumb, level, and true measured from established lines and levels. Provide temporary bracing anchors in formwork for items, which will be constructed into concrete or similar construction. All field cutting, fitting and placement shall be reviewed and approved by the Engineer. Contractor shall notify the Engineer 48 hours in advance of placement of the metal fabrications.
  - 1. Fit exposed connections accurately together to form tight hairline joints.
- D. Contractor shall complete all grouting of frames, posts, sleeves and similar items with non-shrink grout.
- E. Verify alignment of all items with adjacent construction. Contractor shall coordinate installation of metal fabrications with all related work and finishes.

#### **3.02 CLEAN AND TOUCH UP**

- A. Immediately after erection, clean field welds, abraded areas and grouting.

**END OF SECTION**

**SECTION 11 6833**

**OUTBOARD TIEBACK BACKSTOP**

**PART 1 GENERAL**

1.1 SUMMARY

- A. Provide all equipment and materials, and do all work necessary to furnish and install the Backstop Netting System, as indicated on the drawings and as specified herein.

1.2 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this section. Other specification sections that directly relate to work of this Section include, but are not limited to:
  - 1. Section 03 3000 - Cast-in-Place Concrete
  - 2. Section 31 0000 - Earthwork
  - 3. Section 32 1216 - Asphalt Paving
  - 4. Section 32 1600 - Curb, Gutter and Sidewalks
  - 5. Section 32 1813 - Synthetic Turf System

1.3 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. Manufacturers Data and Recommended Installation Requirements.

1.4 SUBMITTALS

- A. The following information shall be submitted prior to installation of specified work
  - 1. Provide drawings of manufacturers recommended installation and foundation requirements prior to actual field installation work for Engineer's review and approval.

1.5 QUALITY ASSURANCE

- A. Manufacturers warranties shall pass to the City and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

1.6 WARRANTY

- A. The netting manufacturer shall provide a warranty to the City that covers defects in materials and workmanship of the netting for a period of 1 year from the date of substantial completion

1.7 DELIVERY, STORAGE AND HANDLING

- A. Materials delivered to the site shall be examined for concealed damage or defects in shipping. Any defects shall be noted and reported to the Engineer.
- B. Replacements, if necessary, shall be immediately re-ordered, so as to minimize any conflict with the construction schedule.
- C. Sound materials shall be stored above the ground under protective cover or indoors so as to provide proper protection.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers and product selections named are provided to establish the minimum standard.

- 1. Outboard Tie-Back Lifting & Tensioning Backstop Netting System (Model #BSTB-XP), or approved equal – As manufactured by:

Beacon Athletics  
8233 Forsythia Street, Ste. 120  
Middleton, WI 53562  
Toll Free: (800) 747-5985  
Fax: (608) 836-0724  
Email: [bids@beaconathletics.com](mailto:bids@beaconathletics.com)  
[www.beaconathletics.com](http://www.beaconathletics.com)

### 2.2 BACKSTOP NETTING SYSTEM EQUIPMENT

- A. Model #BSPB-XP Outboard Tie-Back Lifting & Tensioning Backstop Netting System for athletic activities:
  - 1. Description/Size: See Drawings. Netting system to be raised/lowered and tensioned by means of lifting halyards per manufacturers recommendation.
  - 2. Poles: Round steel sections (ASTM A500B or C) with welded cap plate, straight poles, direct embedment into foundation (optional base plate mounted installation available), black painted finish (other standard colors available), provide vertical cable attached to poles where netting has vertical edge or vertical seam, all connection points for netting system to be welded on the poles prior to painting.
  - 3. Netting: Netting shall be #36 twisted knotted black mesh (340 lb break strength), UV stabilized, min. 1/4" sewn rope binding along perimeter, fence cap recommended at top of any fence located near netting line to avoid netting snag/wear.
  - 4. Hardware: Size all hardware to meet design loads imposed on netting system. Snap hook clips to be zinc plated steel, quick links to be stainless steel. Turnbuckles, thimbles, wire rope clamps to be hot-dip galvanized. Lifting line anchors to be determined per manufacturer design requirements and welded to poles prior to painting. Halyard ropes at poles to be braided Dyneema with composite blocks and

adjustment winches per manufacturer design requirements. Minimum 1/4" diameter 7x19 galvanized uncoated steel wire cable along top and bottom edges of netting system for net attachment and to maintain net shape and reduce sag. 1/4" diameter 7x19 galvanized coated steel wire rope for vertical attachment of netting - cable diameter to be determined by manufacturer design requirements.

5. Design Loads: Provide sealed/signed plans and calculations by a Structural Engineer licensed in the State of California. Netting system, steel poles, and foundations to be designed for wind speeds of 90 mph (ASCE 7-05) or 105 mph (ASCE 7-10), Exposure C, Building/ Occupancy Category I, 1 3/4" mesh (9% solid area). Refer to the project geotechnical report. When no geotechnical soil design recommendations are available assume a minimum allowable passive soil pressure value of 100 psf/ft (to be verified in field prior to foundation installation).

### **PART 3 EXECUTION**

#### **3.1 INSPECTION**

- A. Examine the areas and conditions where equipment and systems are to be installed and notify the Engineer of conditions detrimental to the proper and timely installation and completion of the work.
- B. Do not proceed with the work until unsatisfactory conditions have been corrected by the contractor in a manner acceptable and to the satisfaction of the Engineer.

#### **3.2 INSTALLATION**

- A. All backstop netting equipment shall be installed as indicated on approved submittals as recommended and in strict accordance with manufacturer's written directions and as indicated on the drawings and specified herein.
- B. All concrete footings for backstop netting system shall be installed as indicated on the drawings and in accordance with Section 03 3000, Cast-in-Place Concrete.
- C. All poles and/or sleeves required for backstop netting system installation shall be set plumb and true to line and grade in concrete as indicated on the drawings and per manufacturer's recommendation.
- D. Provide operating and maintenance instructions to Engineer for the proper operation and care of equipment.

#### **3.3 CLEANING**

- A. Upon completion of work in any given area, remove all trash and debris from the work area and leave in clean condition. All pipe, concrete, fabric and miscellaneous parts shall be removed from site.
- B. Dispose of excessive material to certified landfill.

**END OF SECTION**

## SECTION 11 6840 DUGOUT ROOF

### PART 1 GENERAL

#### 1.01 WORK INCLUDED

- A. Provide all equipment and materials, and do all work necessary to furnish and install the athletic equipment, as indicated on the drawings and as specified herein. Athletic equipment shall include, but not be limited to:
  - 1. Dugout Roof

#### 1.02 RELATED WORK

- A. Examine contract documents for requirements that affect work of this section. Other specification divisions and sections that directly relate to the work of this section include, but are not limited to:
  - 1. Section 03 3000 - Cast-in-Place Concrete
  - 2. Section 31 0000 - Earthwork
  - 3. Section 31 2333 - Trenching and Backfill
  - 4. Section 32 1600 - Curb, Gutter and Sidewalks

#### 1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. National Federation of State High School Associations (NFHS)
  - 2. National Collegiate Athletic Association (NCAA)
  - 3. International Association of Athletics Federations (IAAF)
  - 4. American Sports Builders Association (ASBA)
  - 5. American Legion Baseball Guidelines
  - 6. Manufacturers Data and Recommended Installation Requirements

#### 1.04 SUBMITTALS

- A. Manufacturers Product Data
  - 1. Provide manufacturers product data prior to actual field installation work, for Engineer's review.
- B. Shop Drawings
  - 1. Provide drawings of the manufacturers recommended installation and foundation requirements prior to actual field installation work, for Engineer's review.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturers warranties shall pass to the City and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

## 1.06 PRODUCT DELIVERY AND STORAGE

- A. Materials delivered to the site shall be examined for damage or defects in shipping. Any defects shall be noted and reported to the Engineer. Replacements, if necessary, shall be immediately re-ordered, so as to minimize any conflict with the construction schedule. Sound materials shall be stored above ground under protective cover or indoors so as to provide proper protection.

## PART 2 PRODUCTS

### 2.01 GameShade® Dugout

- A. BASE: GameShade® Dugout, or approved equal, as Manufactured and Supplied by:

Sportsfield Specialties, Inc., or approved equal  
P.O. Box 231  
41155 State Highway 10  
Delhi, NY 13753  
p. 607-746-1460  
[www.sportsfieldspecialties.com](http://www.sportsfieldspecialties.com)

- B. DESIGN CRITERIA:

1. Building Code: ASCE 7-10
2. Maximum Wind Speed Rating: 140mph, Exposure Category C
3. Maximum Ground Snow Load: 60psf
4. Seismic Design: Category E, Ss=1.5g, S1=0.75g
5. Roof Pitch: 2" Rise Back-to-Front

- C. COMPONENTS:

1. GameShade® Dugout, or approved equal:
  - a. Overall Dimensions: As shown on the Drawings
  - b. Structural Columns Fabricated of:
    - i. 3-1/2" x 3-1/2" x 3/16" (0.1875") Structural Steel Tube with Factory Pre-Drilled 9" x 9" x 5/8" (0.625") A36 Steel Base Mounting Plates and 9" x 9" x 5/8" (0.625") A36 Steel Roof and Column Cap Plates
    - ii. Fully Welded Construction
    - iii. Maximum Allowable Spacing Between Structural Steel Columns is Fifteen (15') On-Center
  - c. Roof Frame Fabricated of:
    - i. 5" x 2" x 3/16" (0.1875") Structural Steel Rectangular Perimeter, Transverse, and Longitudinal Roof Tubes
    - ii. Fully Welded Construction
  - d. Structural Steel Columns and Roof Frame Receive a Powder Coated Primer and Coated Finish, Various Standard and Custom Colors Available

- e. Roofing Material is 29 Gauge, Classic Rib® Style Corrugated Metal with J-Channel Drip Cap Installed on Front and Sides, Various Standard Paint Finish Colors Available
- f. Structural Columns Attached to Roof Structure with Galvanized Hardware
- g. Includes Carbon Steel Anchoring Hardware, Epoxy and Lifting Eye Bolts
- h. Model Specific Hardware Kit and Installation Instructions
- i. Stamped and Sealed Drawings and Calculations by a Licensed Professional Engineer of Record in the State of California

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION OF EQUIPMENT**

- A. All Dugouts shall be installed as recommended per manufacturer's written instructions and as indicated on the drawings. Concrete anchoring foundations shall be determined by Manufacturer's Structural Engineer based on local soil conditions and building codes. Installer should have a minimum of five (5) Dugout installations or similar experience in the previous three (3) years.

**END OF SECTION**



**SECTION 12 9300**  
**SITE FURNISHINGS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. The General Conditions and all other Contract Documents for this project are complementary and applicable to this Section of the Specifications.
- B. Work Included: furnish all labor, materials, equipment and services necessary to provide and construct, repair or install the site furnishings, complete in place, as shown and specified, including, but not limited to:
  - 1. Backstop
  - 2. Backstop Pad
  - 3. Barrier Net
  - 4. Bases
  - 5. Dugout Railing
  - 6. Fence Cap
  - 7. Flagpole
  - 8. Foul Pole
  - 9. Homeplate
- C. Related Work:
  - 1. 03 3000 Cast-in-Place Concrete
  - 2. 11 6833 Outboard Tieback Backstop
  - 3. 11 6840 Dugout Roof
  - 4. 32 3113 Chain Link Fences and Gates

**1.02 SUBMITTALS**

- A. Submit shop drawings to the Engineer for approval before installing any items. Plans shall include dimensions, color, finish, structural design (custom items) and connection details.
- B. Submit shop drawings of other materials listed in this section to the Engineer for approval before installation.
  - 1. Provide color samples, paint samples, brush outs, material samples or charts for all items.

**PART 2 PRODUCTS**

**2.01 ITEMS**

- A. Backstop
  - 1. Backstop shall be as specified on the Drawings or approved equal.
- B. Backstop Pad
  - 1. Backstop Pad shall be as specified on the Drawings or approved equal.
- C. Barrier Net
  - 1. Barrier Net shall be as specified on the Drawings or approved equal.

- D. Bases
  - 1. Bases shall be as specified on the Drawings or approved equal.
- E. Dugout Railing
  - 1. Dugout Railing shall be as specified on the Drawings or approved equal.
- F. Fence Cap
  - 1. Fence Cap shall be as specified on the Drawings or approved equal.
- G. Flagpole
  - 1. Flagpole shall be as specified on the Drawings or approved equal.
- H. Foul Pole
  - 1. Foul Pole shall be as specified on the Drawings or approved equal.
- I. Homeplate
  - 2. Homeplate shall be as specified on the Drawings or approved equal.

## **2.02 MISCELLANEOUS MATERIALS**

- A. All other materials for site furnishings shall be as specified on the Drawings and these specifications.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Examination: Verify that conditions are satisfactory for installation of each item of site furnishings. When unsatisfactory conditions exist, do not begin installation until such conditions have been corrected.
- B. Installation: Install products in conformance with the manufacturer's recommendations, Drawings and approved shop drawings, and as indicated.
  - 1. Install products square, plumb, level, accurately aligned and securely anchored.
  - 2. Repair abraded areas of shop-applied coating and areas of welds where shop-applied coating has been damaged, using a primer or galvanized repair compound compatible with the shop coating. Repair paint surface per manufacturer's specifications and Engineer direction to match undamaged finish.
  - 3. Completion: Completed installation shall be securely anchored and free from defects and damage in material and finish.

### **3.02 GUARANTEE**

- A. At completion of project, Contractor shall provide Engineer with written guarantee from each manufacturer identifying the nature of warranty for each product component.
- B. Contractor shall provide Engineer with two (2) bound maintenance manuals identifying each piece of equipment on manufacturer's recommended maintenance program including, but not limited to, daily, weekly and monthly check lists.
- C. Contractor shall provide Engineer with minimum of one (1) gallon each type and color of paint used on items with recommended surface preparation and application guidelines.

**END OF SECTION**

**SECTION 26 0500**  
**BASIC ELECTRICAL REQUIREMENTS**

**PART 1 GENERAL**

**1.01 WORK INCLUDED**

- A. Work included in this Section: All materials, labor, equipment, services, and incidentals necessary to provide and install the Electrical Work as shown on the drawings and as specified hereinafter, including, but not limited to the following:
1. Modifications to the existing power distribution system, including new panels, transformers, circuit breaker, and feeders.
  2. Branch circuit wiring, wiring devices and connections to all equipment requiring electrical service.
  3. Lighting fixtures, including switches, raceways and wiring.
  4. Emergency egress/exit illumination system.
  5. Central Emergency Lighting Inverter.
  6. Mechanical equipment power connections, and motor starters where noted.
  7. Low voltage lighting control system and programming.
  8. Transient voltage suppression system.
  9. All required incidental work, such as roof flashing, electrical testing, title 24 acceptance testing, and temporary power.
  10. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.
  11. It is the intent of the drawings and specifications that systems be complete and, except as otherwise noted, be ready for operation.

**1.02 RELATED WORK**

- A. Division 1 - General Requirements

**1.03 INCORPORATED DOCUMENTS**

- A. Requirements of the General Conditions, Supplementary Conditions, and Division 1 Sections apply to all work in this Section, unless modified herein.
- B. Published specifications, standard tests or recommended methods of trade, industry or government organizations apply to work of this Section where cited by abbreviations noted below, unless modified herein.
1. 2019 California Code of Regulations.
  2. 2019 California Building Standards Administrative Code, Part 1, Title 24, C.C.R.
  3. 2019 California Building Code (CBC), Part 2, Title 24, C.C.R. (Based on 2015 International Building Code with 2016 California Amendments).
  4. 2019 California Electrical Code (CEC), Part 3, Title 24, C.C.R. (Based on 2014 National Electrical Code with 2016 California Amendments).
  5. 2019 California Mechanical Code (CMC), Part 4, Title 24, C.C.R. (Based on 2015 Uniform Mechanical Code with 2016 California Amendments).
  6. 2019 California Plumbing Code (CPC), Part 5, Title 24, C.C.R. (Based on 2015 Uniform Plumbing Code with 2016 California Amendments).
  7. California Energy Code, Part 6, Title 24, C.C.R.

8. 2019 California Fire Code (CFC), Part 9, Title 24, C.C.R. (Based on 2015 International Fire Code with 2016 California Amendments).
9. 2019 California Green Building Standards (CALGreen) Code, Part 11.
10. American Society of Civil Engineers 7-10 (ASCE/SEI), Minimum Design Loads for Buildings and Other Structures.
11. Underwriters' Laboratories, Inc. (UL).
12. Local Utility Company regulations.

C. All State and Municipal Codes and Ordinances.

#### **1.04 CONDITIONS AT SITE:**

- A. Visit to site is required of all bidders prior to submission of bid. All will be held to have familiarized themselves with all discernible conditions and no extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not.
- B. Lines of other services that are damaged as a result of this work shall promptly be repaired at no expense to the Owner to the complete satisfaction of the Owner.

#### **1.05 QUALITY ASSURANCE**

- A. Conformance:
  1. All work shall conform to the applicable requirements of Article 1.3 above.
  2. The Contractor shall notify the Engineer, prior to submission of bid, about any part of the design, which fails to comply with abovementioned requirements.
  3. If after contract is awarded, minor changes and additions are required by aforementioned authorities, even though such work is not shown on the drawings or covered in the specifications, they shall be included at Contractor's expense.
- B. Coordination:
  1. The Contractor shall become familiar with the conditions at the job site, and with the drawings and specifications and plan the installation of the electrical work to conform with the existing conditions and that shown and specified so as to provide the best possible assembly of the combined work of all trades.
  2. The Contractor shall work out in advance all "tight" conditions, involving all trades and if found necessary, supplementary drawings shall be prepared by this Contractor, for the Engineer's approval, before work proceeds in these areas. No additional costs will be considered for work, which must be relocated due to conflicts with the work of other trades.
  3. The Contractor shall coordinate and verify all backbox, device, lighting fixture, or equipment mounting requirements with the devices or equipment to be installed, prior to rough in.

#### **1.06 SUBMITTALS**

- A. Product Data:
  1. Comply with the provisions of Section 01 3300 - Submittals.
  2. Within 15 days after award of the Contract, submit:
    - a. Complete electrical, and lighting systems material list of all items proposed to be furnished and installed under this Division. Provide manufacturers data sheets for all devices, raceways, fixtures, equipment, and related products to be used for the Division 26 work.

- b. Manufacturers' specifications and other data required demonstrating compliance with the specified requirements.
    - c. Manufacturers' recommended installation procedures which, when approved by the Engineer, shall become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.
  3. Shop Drawings: Furnish shop drawings and/or equipment cuts for the following:
    - a. Light fixtures.
    - b. Panel boards, and transformers. Panel board submittals shall include diagrams of the circuit breaker arrangements in the panels. Arrange circuit breakers in panels exactly as shown on the panel schedules in the construction documents.
    - c. Circuit breakers
    - d. Disconnect switches
    - e. Motor starters
    - f. Lighting control system
    - g. Central Emergency Lighting Inverter.
    - h. Mechanical and Plumbing equipment. The Electrical Contractor shall review the Mechanical and Plumbing Submittals, and verify the voltage, wire size and overcurrent protection required. Also provide the Electrical Engineer with a copy of the submittals for their review.
    - i. Transient Voltage Surge Suppression system if specified herein and/or indicated on the drawings.
  4. Test Reports:
    - a. Factory Tests: As specified for specific equipment.
    - b. Field Tests: Performance tests as specified for specific equipment.
    - c. Megger Tests: As specified under TESTING.
    - d. When series rated circuit breakers are used, provide a letter from the manufacturer of the equipment confirming that U.L. series rating exists for all protective devices. State the available fault current from the Utility Company and indicate that the overcurrent devices exceed the available fault current at the respective point of protection.
    - e. Special Seismic Certification documentation as per CBC Section 1616A and ASCE/SEI 7-10 requirements for all equipment defined as 'critical' with an importance factor of 1.5 in Paragraph 1.10.M.3 of this Section.
    - f. Manufacturer's Seismic Certification or Project-Specific Design of Supports and Attachments for all other equipment and fixtures as per CBC Section 1616A and ASCE/SEI 7-10 requirements.
  5. Maintenance and Operating Manuals:
    - a. Systems Description: Description of operating procedures.
    - b. Controls: Diagrams and description of operation of each system.
    - c. Equipment: Manufacturer's brochures, ratings, certified shop drawings, maintenance data, and parts lists with part numbers. Mark each sheet with equipment identification number and actual installed condition.
    - d. Materials and Accessories: Manufacturer's brochures, parts lists with part numbers, and maintenance data where applicable. Mark each sheet with identification number of system and location of installation.
    - e. The Maintenance and Operation Manual shall be presented in a three ring binder that has tabbed sections as stated below.
  6. Record Documents: "As-builts": As specified under Paragraph 3.02 of this Section.

### **1.07 DELIVERY, STORAGE AND HANDLING**

- A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all trades.
- B. Delivery and Storage: Deliver all materials to the job site in their original containers with all labels intact and legible at time of use. Store in strict accordance with approved manufacturers' recommendations.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.
- D. This Contractor shall personally, or through an authorized representative, check all materials upon receipt at jobsite for conformance with approved shop drawings and/or plans and specifications.

### **1.08 SCHEDULING/SEQUENCING**

- A. Place orders for all equipment in time to prevent any delay in construction schedule or completion of project. If any materials or equipment are not ordered in time, additional charges made by equipment manufacturers to complete their equipment in time to meet the construction schedule, together with any special handling charges, shall be borne by this Contractor.
- B. The Contractor shall coordinate production and delivery schedule for all Owner-supplied equipment with the equipment suppliers to ensure that all Owner-supplied equipment is delivered to site in coordination with the construction schedule and in such a manner as to cause no delays in completion of the Contract as scheduled.

### **1.09 REQUIREMENTS**

- A. The contract drawings indicate the extent and general arrangements of the conduit wiring systems, etc. If any departures from the contract drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted as soon as practicable, and within thirty-five (35) days after award of the electrical contract.
- B. Unless material list and data is received as a complete and all-inclusive submittal within the stipulated time all items shall be provided as specified, with no deviations permitted.
- C. Any and all additional costs incurred by the substitution of electrical material or equipment, or installation thereof, whether landscape architectural, or electrical, shall be borne by the Contractor under this Section.
- D. Burden of proof of equality of any substitution for a specified product is the responsibility of this Contractor.
- E. Where required by Engineer to ascertain equality of substitute product, Contractor may be requested to provide the specified item and the submitted substitution for comparison, at no additional cost to the Owner.

### **1.10 SEISMIC CERTIFICATION AND INSTALLATION OF EQUIPMENT**

- B. Provide Special Seismic Certification per CBC Section 1616A and ASCE/SEI 7-10 for all equipment and components defined as critical with an importance factor 1.5 in Paragraph 1.10.M.3 of this Section.
- C. Special Seismic Certification shall require either certification through approved analytical method or approved shake table testing in accordance with Section 13.2.5 of ASCE/SEI 7-10 or experience data in accordance with Section 13.2.6 of ASCE/SEI 7-10.
- D. Manufacturer's Seismic Certification or Project-Specific Design of Supports and Attachments for all other equipment and fixtures as per CBC Section 1616A and ASCE/SEI 7-10 requirements.
- E. Provide seismic restraints per applicable code and as specified or indicated. Design restraints to prevent permanent displacement in any direction caused by lateral motion, overturning, or uplift.
- F. Rigidly Supported Equipment, Conduits, and Raceways.
- G. Components supported by chains or simply suspended from above are not required to meet lateral seismic force requirements and seismic relative displacement requirements provided that they cannot be damaged or cannot damage any other component when subject to seismic motion. They must have ductile or articulating connections to the structure at the point of attachment.
- H. Electrical Cabinets:
  - 1. Electrical cabinet design shall conform to National Electrical Manufacturers Association (NEMA) 250 and NEMA ICS6 standards. Cutouts in the lower shear panel that do not appear to have been made by the manufacturer and significantly reduce the strength of the cabinet are not permitted unless analysis demonstrates that the remaining strength is sufficient.
  - 2. Single freestanding cabinets shall have a minimum of four anchor bolts designed and specified with one anchor located at each corner.
  - 3. Multiple sections of cabinets or enclosures located adjacent to each other shall be bolted together. Minimum acceptable bolting is three bolts in the front and back along the adjacent vertical faces - 6 bolts total.
  - 4. Multiple cabinets bolted together to form a section or line-up shall have at a minimum two anchors specified for each cabinet, one at the front and one at the rear.
  - 5. Base anchorage shall be installed through anchor points designated by the Manufacturer. The largest bolt diameter for the anchor hole provided in the equipment shall be provided.
  - 6. A latch or fastener to prevent opening during an earthquake event and damaging the cabinet and internal components shall secure all doors.
  - 7. Slide-out components in electrical control panels, etc., shall have a latching mechanism to hold contents in place.
  - 8. Attached cabling shall have adequate slack or flexibility between the cabinets and surrounding structure supporting the conduit to preclude severing of the cabling due to differential seismic displacements.
- I. The design load shall include the effects of loading on the equipment imposed by attached utility or service lines that are also attached to separate structures.



- J. The attachment of additional external items is not permitted unless such items have either been provided by the Manufacturer, or analysis shows that their effects are supported by design.
- K. Critical Equipment:
  - 1. Design with importance factor of 1.5.
  - 2. Provide Special Seismic Certification for all equipment and components and their installation per CBC and ASCE/SEI requirements.
  - 3. Critical Equipment shall include the following:
    - a. Central Emergency Lighting Inverter.
- M. Seismic Design Submittals: For all Critical Equipment included in paragraph 26 05 00.1.10.M.3.
  - 1. The Manufacturer of each item of critical equipment shall arrange for the testing or analysis by an approved agency of each component and assembly and its mounting system or anchorage.
  - 2. The Manufacturer shall submit a Certificate of Compliance for each item for approval by the by the Authority Having Jurisdiction.
  - 3. Based on Manufacturer's approved submittal, Contractor shall retain the services of a State of California registered Structural Engineer to prepare final installation details and drawings for equipment supports and attachments.
  - 4. Submit drawings of the equipment showing dimensions, support equipment, connections, and the proper anchorage locations.
  - 5. Equipment weight and weight distribution (e.g., center of gravity in elevation and plan).
  - 6. Thickness of sheet metal bases.
  - 7. Seismic Vibration Isolation Devices: Manufacturer's product information indicating class and type. Indicate load ratings as published manufacturer's data or shop drawings. Indicate proper orientation of devices on plan.
  - 8. Inertia bases and support frames.
  - 9. Specific details of restraints including anchor bolts and welds and maximum load at each location.
- O. Independent Supports: An independent means of secure support shall be provided for all wiring methods in non-fire-rated assemblies. Where independent support wires are used, they shall be distinguishable by color, tagging, or other effective means.

#### **1.11 GUARANTEE**

- A. This Contractor shall guarantee that all work executed under this Section will be free from defects of materials and workmanship for a period of one (1) year or as per the General Conditions of this project, whichever is longer. Dates shall be from the date of final acceptance of the building. The contractor shall further guarantee that he will, at his own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the guarantee. Such repair or replacement shall be guaranteed for one (1) year from the date of repair or replacement.

#### **1.12 PERMITS AND INSPECTIONS**

- A. This Contractor shall arrange for and obtain all required permits and inspections.
- B. Do not allow or cause any of the work to be covered or enclosed until it has been tested and/or inspected.

## 1.14 IDENTIFICATION

- A. Switchgear, switchboards, distribution panels, and feeder circuit breakers therein, panels, disconnect switches, motor starters, transformers, motor disconnect switches, cabinets, and other apparatus used for the operation of, or control of circuits, appliances or equipment, shall be properly identified by means of engraved laminated plastic descriptive nameplates mounted on apparatus using stainless steel screws. Nameplates shall have white letters with black background and be submitted to the Engineer for approval. Cardholders in any form are not acceptable.
- B. Provide p-touch style labeling of circuit designations for all receptacles on the project.
- C. Each branch circuit of panel boards to have a permanently fixed number with load directory, mounted under celluloid on inside of cabinet door, showing circuit numbers and typewritten description of equipment supplied by breakers. Where changes are made to existing panelboards, newly typewritten circuit directories shall be prepared to replace existing directories.
- D. Provide label on all motors: "Caution. Automatic equipment. May start at any time."
- E. Provide silk-screened or engraved identification labels on all switch box covers identifying specific loads that are not readily apparent to the user.
- F. Provide identification of all pull boxes, junction boxes, and conduit stub-ups on the project as outlined below:
  - 1. For Power Feeders:
    - a. Stencil cover with identifying circuit number.
    - b. Lettering 1" high.
    - c. Color of lettering black.
    - d. Place lettering on cover in neat manner; run parallel to long sides of box.
  - 2. For branch circuits, grounding, communication, signal, and control systems boxes and blank conduit stub-outs:
    - a. Paint inside back of each j-box, front of each cover, and ends of each blank conduit stub-out with identifying system color as listed below:
      - 1) 277/480-volt                      Orange
      - 2) 120/208-volt                      Blue
      - 3) Lighting control                      Orange/White
      - 4) Ground system                      Green

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. Refer to applicable Division 26 Sections for complete products specifications.

### 2.02 MATERIALS

- A. Materials of the same type or classification, used for the same purpose, shall be the product of the same manufacturer.

### **2.03 ACCEPTABLE MANUFACTURERS**

- A. Materials shall be of make mentioned elsewhere in this specification. All materials shall be the best of their several kinds, perfectly new and approved by the Underwriters' Laboratories.
- B. Where material, equipment, apparatus or other products are specified by manufacturer, brand name, type or catalog number, such designation is to establish standards of desired quality, style and utility and shall be the basis of the bid. Materials so specified shall be furnished under the contract unless changed by written approval of the Engineer. Where two or more designations are listed, choice shall be optional with this Contractor, but this Contractor must submit his choice for final approval.

### **2.04 POSTED OPERATING INSTRUCTIONS**

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

### **2.05 CATALOGED PRODUCTS/SERVICE AVAILABILITY**

- A. Materials and equipment shall be current products by manufacturers regularly engaged in the production of such products. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The 2-year period shall be satisfactorily completed by a product for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6,000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished. The equipment items shall be supported by service organizations which are reasonable convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

## **PART 3 EXECUTION**

### **3.01 INSPECTION**

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

### **3.02 PREPARATION**

- A. Drawings:

1. The general arrangement and location of wiring and equipment is shown on the electrical drawings and shall be installed in accordance therewith, except for minor changes required by conflict with the work of other trades.
  2. The Contractor shall coordinate and verify all backbox, device, lighting fixture, or equipment mounting requirements with the devices or equipment to be installed, prior to rough in.
  3. Drawings indicate the circuit and panel which supplies each device or fixture. Provide and install conduit and conductors to make all connections from panel to nearest device and from first device to additional devices on same circuit. Conduit size and fill shall satisfy NEC requirements. Do not exceed 4 #12 or 3 #10 conductors in a 1/2" conduit, 7 #12 or 5 #10 in a 3/4" conduit, and 11 #12 or 9 #10 in a 1" conduit, unless otherwise noted. Provide common handle-tie on breakers for multi-wire branch circuits (with common neutral), per NEC. If more than three current carrying conductors are installed in one conduit, conductor size shall be increased as required per NEC. Do not share neutrals for branch circuit runs.
  4. Control wiring is generally not shown on the plans. Contractor shall refer to control diagrams and provide and install all wiring and raceways required to make all interconnections.
  5. All branch circuit wiring No. 12 or No. 10 as noted, all control wiring No. 14, except as noted next to "slash marks" on the drawings, or as noted under "Wire," as specified herein.
  6. All dimensions taken from the Landscape Architectural Drawings, verified at site by this Contractor.
  9. Maintain "as-built" records at all times, showing the exact location of concealed conduits and feeders installed under this contract, and actual numbering of each circuit. Upon completion of work and before acceptance can be considered, this Contractor must forward to the Engineer, updated CAD plans, corrected to show the electrical work as actually installed.
  10. Branch circuit conductors shall be #12 minimum and #10 minimum for runs longer than 150 feet.
- B. Measurements: Before ordering any material or closing in any work, verify all measurements on the job. Any differences found between dimensions on the drawings and actual measurements shall be brought to the Engineer's attention for consideration before proceeding.

### **3.03 FIELD QUALITY CONTROL**

- A. All workmanship shall be first class and carried out in a manner satisfactory to and approved by the Engineer.
- B. This Contractor shall personally, or through an authorized and competent representative, constantly supervise the work and so far as possible keep the same foreman and workmen on the job throughout.

### **3.04 EMERGENCY POWER SOURCES**

- A. All emergency source circuits shall be installed in separate raceways (from normal power), per NEC 700.10(B), or the applicable code at the time of permitting.

### **3.07 TEMPORARY LIGHTING AND POWER**

- A. Provide and install temporary lighting and power systems for the duration of construction, of adequate size to accommodate the required lighting and power loads. Coordinate with other trades to insure adequate sizing.
- B. Provide distribution equipment as required to support all construction activities.

### **3.08 ADJUSTING AND CLEANING**

- A. All electrical equipment, including existing equipment not "finish painted" under other sections, shall be touched up where finished surface is marred or damaged.
- B. All equipment, lighting fixtures, etc., shall be left in clean condition, with all shipping and otherwise unnecessary labels removed there from.

### **3.10 SCHEDULES**

- A. Coordination: Coordinate installation of electrical items with the schedule for other work to prevent unnecessary delays in the total Work.

### **3.11 WARNING SIGN MOUNTING**

- A. Provide the number of signs required to be readable from each accessible side, but space the signs a maximum of 30 feet apart.

### **3.12 PAINTING OF EQUIPMENT**

- A. Factory Applied: Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test, except equipment specified to meet requirements of ANSI C37.20 shall have a finish as specified in ANSI C37.20.
- B. Field Applied: Paint electrical equipment as required to match finish or meet safety criteria. Painting shall be as specified in the respective equipment section.

### **3.13 TESTS**

- A. Testing and inspection: See Section 26 0800 - Testing.

**END OF SECTION**

**SECTION 26 0800**  
**TESTING**

**PART 1 GENERAL**

**1.01 WORK INCLUDED**

- A. Work Included in This Section: All materials, labor, equipment, services, and incidentals necessary to perform the testing and inspection of the electrical work, including but not limited to the general systems noted below:
  - 1. Grounding system.
  - 2. Lighting system.
  - 3. Distribution system.
  - 4. Lighting control system.
  - 5. Lighting emergency inverter system.
  - 6. Title 24 Acceptance Testing.
- B. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.
- C. All work shall comply with Sections 26 0500 and 26 2700.
- D. In addition to the general system tests and inspections indicated above, the Contractor shall perform the following inspections and tests. The Contractor shall provide all material, equipment, labor, and technical supervision to perform such tests and inspections:
  - 1. System Grounding.
  - 2. Panelboards.
  - 3. Feeders.
- E. The purpose of these tests is to assure that all tested electrical equipment is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications.

**1.02 APPLICABLE CODES, STANDARDS, AND REFERENCES**

- A. All inspections and tests shall be in accordance with the International Electrical Testing Association - Acceptance Testing Specifications ATS-2017 (referred to herein as NETA ATS-2017).

**1.03 QUALIFICATIONS**

- A. Qualifications of the Testing Firm shall be as listed in NETA ATS-2017.

## **PART 2 PRODUCTS**

### **2.01 THIS ARTICLE DOES NOT APPLY TO TESTING.**

## **PART 3 EXECUTION**

### **3.01 GENERAL**

- A. Final test and inspection to be conducted in presence of the Authority having Jurisdiction (AHJ) or Inspector of Record (IOR). Test shall be conducted at the expense of, and managed by, the Contractor, at a mutually agreed time. Submit written test report of all tests, with test result values and overall outcome.
- B. All portions of the electrical installation shall be inspected and tested to ensure safety to building occupants, operating personnel, conformity to code authorities and Contract Documents, and for proper system operation.

### **3.02 INSPECTIONS AND TESTS**

- A. Tests: Field tests shall be performed and reports submitted, as per Section 26 0500, Part 1.
  - 1. Final Inspection Certificates: Prior to final payment approval, deliver to the Engineer, with a copy to the Landscape Architect, signed certificates of final inspection by the appropriate local authority having jurisdiction.
- B. Grounding System:
  - 1. All ground connections shall be checked and the entire system shall be checked for continuity.
  - 2. Ground tests shall meet or exceed the requirements of the National Electric Code.
- C. Lighting Systems:
  - 1. The lighting systems shall be checked for proper local controls and operation of entire installation, including the operation of the low voltage lighting control system.
- D. Power Distribution System:
  - 1. Test main switchboard, distribution boards, panel boards, and transformers for grounds and shorts with mains disconnected from feeders, branch circuits connected and circuit breakers closed, all fixtures in place and permanently connected and grounding jumper to neutral lifted and with all wall switches closed.
  - 2. Test each individual circuit at each panelboard with equipment connected for proper operation. Inspect the interior of each panel.
  - 3. Check verification of color coding, tagging, numbering, and splice make-up.
  - 4. Verify that all conductors associated with each circuit are in same conduit.
  - 5. Demonstrate that all lights, jacks, switches, outlets, and equipment operate satisfactorily and as called for.
  - 6. Perform megger tests of all distribution system feeders prior to energizing. All Cables failing megger tests or with evidence of damage shall be removed and replaced in their entirety (no splices), at no cost to the Owner. Damaged cables may not be field repaired without specific approval of the Engineer.
- E. Lighting Control System: Verify that all equipment, components, and devices function as specified.

- F. Title 24 Acceptance Testing: Contractor shall complete the requirements for Title 24 Acceptance Testing, as per CA Title 24, Part 6.
1. Perform testing requirements as per Title 24 Lighting Acceptance requirements. Testing shall include construction inspection of installed controls, occupancy / motion sensor testing, manual daylighting controls testing, automatic time switch controls testing, and demand response system interface, as applicable.
  2. Complete and submit all required forms for complete Acceptance Testing.
  3. Obtain required review and approval of Acceptance Forms to allow final certificate of occupancy to be granted.

**END OF SECTION**



**SECTION 26 2400  
SERVICE AND DISTRIBUTION SYSTEM**

**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Work Included in This Section: All materials, labor, equipment, services and incidentals necessary to install the electrical work as shown on the drawings and as specified hereinafter, including but not limited to the work listed below.
- B. Temporary power for construction.
- D. Transformers, Distribution System, Panel Boards, Grounding, and Overcurrent Protective Devices.
- E. All required incidental work, such as excavating, backfilling, testing, and temporary power.
- F. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.
- G. All work shall comply with Sections 26 0500 and 26 2700.

**1.02 RELATED WORK**

- A. General Conditions.

**1.03 SUBMITTALS**

- A. Comply with the provisions of Section 26 0500 - Submittals.

**PART 2 - PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURERS**

- A. Refer to Section 26 0500, Part 2 - Products
- B. All new equipment shall match existing.
- C. List of Equipment Manufacturers:

Panelboards

Eaton-Cutler Hammer, General Electric, Industrial Electric Manufacturing, Schneider-Square D.

Dry-type Transformers

Eaton-Cutler Hammer, Schneider-Square D, General Electric.

## 2.02 MATERIALS

### A. Grounding:

1. Provide and install grounding system as noted on the drawings.
2. Grounding electrode conductor: bare stranded copper type, #4/0 minimum.
3. Install ground wires in rigid conduit.
4. Furnish and install solid copper or copper-clad 5/8" x 10'-0" ground rod(s). Where multiple ground rods are shown, install a minimum of 20'-0" apart. Install ground rods in accessible boxes with covers. Furnish and install 2-#4/0 bare copper cables between multiple ground rods and main switchboard ground bus.
5. Terminate grounding conduits at equipment with ground bushing, with ground wire connected through bushing.
6. Provide No. 12 stranded (green) THHN conductor from outlet box to ground screw of every receptacle.
7. Ground all isolated sections of metallic raceways.
8. Provide #12 minimum stranded (green) THHN conductor sized per NEC, or as noted, connected continuously throughout branch circuit for all circuits, bonded to panel ground bus, and to all electrical devices and equipment enclosures.

### B. Panelboards:

1. Surface with branch circuits as indicated on the drawings.
2. Enclosures: code gauge galvanized sheet steel with welded full flange end pieces, stretcher- leveled steel trim, backpan and door.
3. Bussing of copper with silver-plated contact surfaces.
4. Trims on surface-mounted cabinets secured with nickel-plated screws with cup washers, bottom of all trims to have lugs for resting on cabinet flange.
5. Panels shall be 20 inches minimum in width, provided with approved gutter space, barriers and adjustable supports. Doors mounted with concealed hinges provided with combination spring latch and lock. Doors and trims and surface mounted cabinets primed and finished with one coat baked on gray enamel. All visible panel enclosures and covers in finished (occupied) areas shall be painted to match adjacent wall finish.
6. Breakers on same phase to be aligned horizontally. Each panel provided with quantity (5) spare handle locks. Install handle locks on all breakers serving fire alarm equipment.
7. Each branch circuit of panelboards to have a permanently fixed number with one word directory, mounted under celluloid on inside of cabinet door, showing circuit numbers and typewritten description of outlets controlled by breakers. Color code mains and each breaker terminal, same as conductor insulation.
8. Each panel shall be equipped with a copper ground bus.
9. All panels shall be fully bussed to accept future circuit breakers, with breaker hardware provided where indicated on the drawings.
10. Panel board submittals shall include diagrams of the circuit breaker arrangements in the panels. Arrange circuit breakers in panels exactly as shown on the panel schedules in the construction documents - no deviations permitted.
11. Where panelboards are installed outdoors or in wet locations, provide with weatherproof NEMA 3R enclosures.

### C. Circuit Breakers:

1. General: Circuit breakers shall be molded case rated for 480 or 240 volts, multiple or single pole and amperage rating as shown on the drawings, bolt on, manually operated with "de-ion" arc chutes. New circuit breakers in existing equipment shall match the existing equipment manufacturer & AIC rating.

2. Branch circuit breakers shall be rated for the amps interrupting capacity or U.L. series rated with the distribution and main circuit breakers, General Electric type THQB or equal, minimum 10,000 A.I.C for 120/208 volt; type TEY or equal, minimum 14,000 A.I.C for 277/480 volt.
- D. Dry-Type Transformers:
1. Ventilated type.
  2. Dry-type general distribution transformers shall meet the California Title 24 requirements for energy efficiency standards and DOE 10 - CFR, Part 431 (2016) for energy efficient transformers.
  3. Transformer shall be 3 phase, 60 Hertz. Primary winding shall be Delta connected and secondary winding shall be Wye connected. The temperature rise at rated voltage and full load shall not exceed 150 degrees C with a 220 degrees C U.L. Component Recognized Insulation System. The windings shall be aluminum or copper.
  4. The higher voltage winding shall have quantity (6) 2.5% taps - (2) FCAN and (4) FCBN. Set secondary voltage for 120/208V.
  5. Transformer terminals shall be front connected for ease of installation and maintenance.
  6. Where the transformers are installed outdoors provide weatherproof drip cover, rodent screen and a weathertight rating of the enclosure.
- E. Magnetic starters: shall be rated in accordance with latest published NEMA standards for size and horsepower rating, Eaton-Cutler Hammer A-200 series or equal. Provide with overload sensor in each phase, hand-off-auto switch, red "run" pilotlight, in NEMA 1, NEMA 4X, or NEMA 3R enclosure or in motor control center where indicated. Coil shall be rated 120 VAC. Starters shall be across-the-line nonreversing unless otherwise noted.
1. Contacts: Across-the-line magnetic starters shall be equipped with double break silver alloy contacts. All contacts shall be replaceable without removing power wiring or removing starter from panel. The starter must have straight-through wiring.
  2. Coils: Coils shall be of molded construction. All coils shall be replaceable from the front without removing the starter from the panel.
  3. Overload Relays and Thermal Units: Overload relays shall be the melting alloy type with a replaceable control circuit module. Thermal units shall be of one-piece construction and interchangeable. The starter shall be inoperative if the thermal unit is removed.

### **PART 3 - EXECUTION**

#### **3.01 REFER TO SECTION 26 0500 FOR DETAILS OF WORK UNDER THIS SECTION.**

#### **3.02 INSTALLATION/APPLICATION/ERECTION**

- A. Excavate and trench as necessary for the electrical installation, and when the work has been installed, inspected and approved, backfill all excavations with clean earth from excavation, or imported sandy soil in maximum 8" (eight-inch) layers, moisten and machine tamp to 95% compaction, and restore the ground and/or paving or floor surfaces to their original condition.
- B. Panel Installation: Mount as detailed on the drawings.
- C. Motor Connections:
1. Install motor circuits complete for all motors by other trades
  2. Furnish and install all disconnect switches, outlet boxes, etc., as required by code.

3. All motor and temperature control low voltage wiring shall be installed and connected by Division 23 Section of specifications, unless otherwise indicated on electrical drawings.

D. Motor Starters Installation:

1. Deliver starters to site without thermal overload elements. Determine nameplate rating of each motor, after motor and starter installation, select thermal element rating from measured motor running current and install proper elements in starters.
  - a. Submit chart denoting motor designation, motor H.P., motor running current (N.P.), actual running current fuse/breaker size and thermal element catalog number. Take readings of motor running currents in conjunction with Division 23 - Heating, Ventilating, and Air Conditioning.

**3.03 TESTS**

- A. Testing and Inspection: See Section 26 0800 - Testing.

**END OF SECTION**

**SECTION 26 2700**  
**BASIC ELECTRICAL MATERIALS AND METHODS**

**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Work included in this Section: All materials, labor, equipment, services, and incidentals necessary to install the electrical work as shown on the drawings and as specified hereinafter, including but not limited to the work listed below:
  - 1. Raceways, feeders, branch circuit wiring, wiring devices, safety switches and connections to all equipment requiring electric service.
- B. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.
- C. All work shall comply with Section 26 0500.

**1.02 RELATED WORK**

- A. General Conditions

**1.03 SUBMITTALS**

- A. Comply with the provisions of Section 26 0500.

**PART 2 - PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURERS**

- A. Refer to Section 26 0500, Basic Electrical Requirements, Part 2 - Products.
- B. List of Equipment Manufacturers:

Conduit and Conduit Fittings

Allied Tube and Conduit, Wester Tube and Conduit, LTV Steel Tubular, National Electric Products, AFC, Republic Steel Corporation, Rome Cable Corporation, United States Steel Corporation, Killark Electric Manufacturing Company, Raco, VAW Aluminum Company, Bridgeport, Steel City, Thomas & Betts, Carlon, O.Z. Gedney, Appleton, Regal.

Wire and Cable (600V)

American Wire Company, General Wire and Cable Corporation, Okonite Company, Rome Cable Corporation, Cerrowire, American Insulated Wire, AFC Cable Systems, Essex, Simplex Wire and Cable Company, Southwire.

Solderless Lugs and Grounding Connections

Burndy Engineering Company Inc, O.Z. Gedney Company Inc, Penn Union Electric Corporation, Thomas and Betts Company Inc.

Pull Boxes, Gutters, Special Cabinets

Schneider-Square D Company, Columbia Electric Manufacturing Company, General Electric Company, Eaton Inc.

Outlet Boxes

Appleton Electric Company, Killark Electric Manufacturing Company, Lew Electric Fittings Company, National Electric Products Corporation, Raco, Steel City Electric Company, Carlon, Bowers.

Wiring Devices

Leviton, Arrow-Hart, Cooper, Hubbell, Lutron, Bryant.

Conduit Racks, Hangers

General Electric Company, Killark Electric Manufacturing Company, Caddy, National Electric Products Corporation, Republic Steel Corporation, Rome Cable Corporation, United States Steel Corporation, VAW Aluminum Company, Superstrut, B-Line.

Safety Switches (Disconnect and Fusible)

Schneider-Square D Company, Eaton-Cutler Hammer Inc, General Electric Company.

Fuses

Bussman Manufacturing Company, Chase-Shawmut Company.

Firestopping

3M, Nelson.

**2.02 MATERIALS**

- A. Raceways: Only the raceways specified below shall be utilized on this project. Substitutions shall be pre-approved in writing. All bare conduit ends (stub-ups or stub-outs) shall be provided with bushed ends or manufactured insulated throat connectors:
1. Rigid Type - hot dip galvanized or sherardized steel, use on all interior and exterior locations, below grade or in concrete slab, and to 18" on either side of structural expansion joints in floor slabs, with completely watertight, threaded fittings throughout. Compression fittings are not acceptable.
    - a. All rigid steel conduit couplings and elbows in soil or concrete or under membrane to be ½ lap wrapped with Scotch #50 tape and threaded ends coated with T&B #S.C.40 rust inhibitor prior to installation of couplings.
    - b. ½ lap wrap all rigid steel conduit stub-ups from slab or grade to 6" above finished grade level with Scotch #50 tape.
  2. In lieu of rigid steel conduit for power and control raceways and branch circuit conduits in soil or concrete slabs, "Schedule 40" PVC with Schedule 80 PVC conduit elbows and stub-ups may be used with code size (minimum No. 12) ground wire. A "stub-up" is considered to terminate 6" above the finished surface.
    - a. Schedule 80 PVC conduit shall be used in all concrete footings or foundations and to 18" of either side of footings or foundation walls.

- b. Schedule 80 PVC conduit shall be used in all concrete masonry unit (CMU) walls or columns.
- c. All conduit runs in concrete floor slabs (where allowed) shall be installed to comply with all applicable CBC and structural codes to maintain the structural integrity of the floor slab. Where conflicts occur, alternate routing shall be provided at no additional cost to the City.
- d. Where schedule 80 PVC is coupled to schedule 40 or other raceways with differing interior dimensions, each end shall be reamed with a reaming tool to reduce the edge profile for protection of the passing conductors during the pull.
3. Intermediate metal conduit may be used in all exposed interior locations, except that electrical metallic tubing may be used in some locations as noted below. Utilize steel compression type fittings for all exposed conduit runs, unless otherwise noted. Cast fittings are unacceptable.
4. Electrical metallic tubing may be used exposed in interior electrical and mechanical rooms, in interior unfinished spaces, and in interior concealed and furred spaces, made up with steel watertight or steel set screw type fittings and couplings. EMT shall not be used in under-building crawl spaces or other areas subject to moisture. Set screws shall have hardened points. Cast fittings are unacceptable.
5. Flexible conduit shall be used in the following instances:
  - a. For all motor, transformer and recessed fixture connections, minimum 1/2"; "Seal tite" type used outdoors and in all wet locations, provide with code size (minimum No. 12) bare ground wire in all flexible conduit.
  - b. Where existing conditions preclude the installation of EMT in existing walls to remain, provide and install cut-in type boxes and "fish" flexible MC or flexible conduit and wire through existing walls to remain, unless shown otherwise on plans.
  - c. With the exception of the above, flexible conduit shall not otherwise be used on this project.
6. All conduit cuts (factory or field cut) shall be perfectly square to the length of the conduit and cut ends shall be reamed with a reaming tool to provide a smooth edge to the passing conductors and to remove all burs and scrapes. Use of a hand file is not acceptable.
7. All electrical raceways shall be installed concealed, unless otherwise noted. Cut and patch to facilitate such installation to match adjacent and original finish. All exposed conduits, where required, shall be installed parallel to building members.
8. All emergency source circuits shall be installed in separate raceways (from normal power), per 2019 NEC 700.10(B), or the applicable code at the time of permitting.
9. Fasten conduits securely to boxes with locknuts and bushings to provide good electrical continuity.
10. Provide chrome escutcheon plates at all exposed wall, ceiling and floor conduit penetrations.
11. Support individual suspended conduits with heavy malleable strap or rod hangers; supports for 1/2 inch or 3/4 inch conduit placed on maximum 7-foot centers; maximum 10-foot centers on conduits 1 inch or larger.
12. Support multiple conduit runs from Kindorf B907 channels with C-105 and C-106 straps.
13. Conduit bends - long radius.
14. Flash conduits through roof, using approved roof jack; coordinate with General Contractor.
15. To facilitate pulling of feeder conductors, install junction boxes as shown or required.
16. All empty conduits on the project shall be provided with a nylon pull rope to allow pulling of future conductors intended for the specific raceway. Provide plastic wire-tie style nameplate tags on each end of pull rope with printed identification of conduit use

- and the location of the opposite end of the rope. Pull ropes for telecommunications service conduits shall meet the utility company requirements.
17. Where conduits pass through structural expansion joints in floor slab, rigid galvanized conduit shall be used 18" on either side of joint, complete with Appleton expansion couplings and bonding jumpers, or equal. All above grade expansion joint crossings shall also utilize expansion joint couplings or flex conduit transitions as required for each particular installation. Installed condition shall allow for a minimum deflection of raceway and wire (in any direction) equal to the structural expansion joint dimension (building to building). No solid conduits shall be allowed to cross expansion joints without proper provisions for building and seismic movement.
  18. Minimum cover of conduits in ground outside of building - 36 inches, unless otherwise noted.
  19. Provide and install exterior wall conduit seals and cable seals in the locations listed below. Coordinate installation and scheduling with other trades:
    - a. Conduit seals through exterior wall or slab (below grade): O.Z. Gedney series "FSK" in new cast in concrete locations, series "CSM" in cored locations.
    - b. Conduit seals through exterior wall or slab (above grade): O.Z. Gedney series "CSMI."
    - c. Cable seals at first interior conduit termination after entry through exterior wall or slab: O.Z. Gedney series "CSBI." Coordinate quantity of conductors at each location.
- B. Outlet Boxes and Junction Boxes. Verify all backbox requirements with devices to be installed prior to rough-in.
1. One piece steel knockout type drawn boxes, unless otherwise noted, sized as required for conditions at each outlet or as noted.
  2. Flush-mounted boxes equipped with galvanized steel raised covers for device mounting flush with finished surface. Provide extension rings as required on all acoustical or additional wall treatment areas to bring top of cover flush with finished surface (coordinate with landscape architectural drawings). Devices shall be capable of being tightly mounted to boxes without distorting or bending device or mounting hardware.
  3. Boxes for fixture outlets: 4-inch octagon or larger as required, or as noted.
  4. Switch and receptacle outlets - not smaller than 4-inch-square in furred walls, with raised cover for single device; ganged where required.
  5. Outlet and switch boxes for wet locations, cast aluminum FS or FD type with cast aluminum gasketed spring lid cover. Weatherproof "Bell" type boxes are not acceptable.
  6. All connectors from conduit to junction or outlet boxes shall have insulated throats. Connectors shall be manufactured with insulated throats as integral part. Insertable insulated throats are unacceptable.
  7. Outlet boxes for telecommunications, 4" square or larger as required or noted, multi-ganged for voice, data, and other services where indicated on the drawings.
  8. Conduit Bodies: Malleable iron type, with lubricated spring steel clips over edge of conduit body, O-Z/Gedney type EW, or equal.
  10. Pull boxes: All site pull boxes shall be flush in-ground concrete, with engraved covers identifying service use (i.e. electrical, communications, etc.). Boxes shall be Nema 250, Type 6, outside flanged, with recessed cover for flush mounting, by Christy or equal, with required depth to provide box and conduit depths shown or required.
    - a. Provide concrete covers for all boxes in planted or paved areas (up to available concrete cover size).
    - b. Provide galvanized steel covers for all larger boxes (when concrete is not available), or in traffic areas. No cast iron covers.



- c. Provide bolted covers and slab bottoms (with grouted perimeter) or vault type boxes for all electrical distribution and signal system pull boxes used for site distribution, to prevent rodent entry. No collar type boxes with dirt or gravel bottoms
  - d. Provide drain hole at bottom of all vault type boxes, with loose aggregate base below, for proper drainage.
  - e. All covers to be completely flush with finished adjacent surfaces.
  - f. Provide galvanized steel H20 rated covers and installation of box rated for H20 in all traffic areas.
  - g. Provide pullboxes per utility company specifications for all electrical primary and secondary services and for telecommunications service runs. Verify exact size and type prior to order with each utility company.
- C. Wire and Cable (line voltage and signal systems):
- 1. 600-volt class where used for or run with line voltage power wiring, insulation color coded, minimum No. 12 AWG for power branch circuits, No. 14 for power control circuits, and wiring size and type as directed by signal system manufacturer for each signal system.
  - 2. All conductors shall be copper.
  - 3. Size and insulation type:
    - a. Use 75 degree C insulation ratings on this project, regardless of insulation allowable ratings, unless specifically indicated otherwise on the drawings.
    - b. Standard locations: #12 to #1 AWG: THWN/THHN dual rated for all wet and dry locations; #1/0 through #4/0 AWG: XHHW (55 Mils) for all wet and dry locations; 250MCM and larger: XHHW (65 Mils). All wire sizes used shall be based on a 75 degree insulation rating, unless specifically used with 90 degree rated breakers and devices.
    - b. All wiring (power and signal) installed underground between buildings, or in wet or damp locations, shall be outside listed and rated for wet locations.
    - c. High temperature and non-standard locations: Provide wire type and insulation category suitable for area of use as defined in NEC Article 310.
    - d. Photovoltaic applications: provide 90 degree C insulation ratings.
  - 4. Conductors No. 8 and larger and as otherwise noted on drawings shall be stranded. Power conductors No. 12 and No. 10 shall be solid or stranded. Power conductors No. 14 or smaller shall be solid.
  - 5. Provide signal system wiring for each system to meet the system manufacturers requirements and recommendations for each device or equipment type. Signal wiring systems shall be provided with shielding and/or insulation type and cable quantities as directed by the manufacturer, and meet all NEC requirements for locations used.
  - 6. Install all wiring branch circuits and feeders (low voltage and line voltage) in conduit unless noted otherwise on the drawings. Contractor shall mandrel all feeders and pass a "sock" (or utilize other suitable means) through each raceway prior to pull to remove all water and construction debris. All raceways shall be completely clear of any obstructions or debris and all cut ends shall be reamed, prior to pull. Utilize pulling compound on all runs to insure minimum friction and pulling tension.
  - 7. Megger test all feeders prior to energizing. See section 26 0800 for additional information.
  - 8. Approximately balance branch circuits about the neutral conductors in panels.
  - 9. Connections to devices from "thru-feed" branch circuit conductors to be made with pigtails, with no interruption of the branch circuit conductors.
  - 10. Neutral conductor identified by white outer braid, with different tracers of "EZ" numbering tags used where more than one neutral conductor is contained in a single raceway.

11. Neatly arrange and "marlin" wires in panels and distribution panelboards with "T and B Ty-rap" or approved equal plastic type strapping.
12. All wire and cable shall bear the Underwriters' Label, brought to the job in unbroken packages; wire color-coded as follows:

<u>Voltage</u>	<u>Phasing</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>N</u>
120/208	3PH4W	Black	Red	Blue	White
2083PH	3W	Black	Red	Blue	--
277/480	3PH4W	Brown	Orange	Yellow	White
4803PH	3W	Brown	Orange	Yellow	--

13. The equipment grounding conductor shall be insulated copper; where it is insulated, the insulation shall be colored green.
  14. Label each wire of each electrical system in each pull box, junction box, outlet box, terminal cabinet, and panelboard in which it appears with "EZ" numbering tags indicating the connected circuit numbers.
  15. Provide permanently affixed adhesive labels with machine printed lettering (min. 1/8" high) at junction boxes serving fixtures that are supplied by (2) electrical sources (i.e. normal and emergency lighting). Label to read "CAUTION - This light fixture is powered by (2) separate sources. The normal power source breaker and the emergency power source breaker must be turned off before servicing this light fixture."
  16. Install feeder cables in one continuous section unless splices are approved by the Engineer. Exercise care in pulling to avoid damage or disarrangement of conductors, using approved grips. No cable shall be bent to smaller radius than the spool on which it was delivered from the manufacturer. Color code feeder cables at terminals. Provide identifying linen tags in each pullbox.
- D. Switches: Model numbers are Hubbell, color to be selected by Landscape Architect, unless otherwise noted. All switches to utilize screw terminals for wire connections - no plug-in terminations:
1. Single Pole - No. HBL1221
  2. Two Pole - No. HBL1222
  3. Three Way - No. HBL1223
  4. Momentary contact - No. HBL1557
  5. Momentary contact Keyed - No. HBL1556L
  6. Keyed, - No. HBL1221L
  7. Pilot Light (on with load on) - Hubbell No. 1221-PLC
  8. Motor Rated Double Pole (30A) - Hubbell No. 7832
  9. Motor Rated Three Pole (30A) - Hubbell No. 7810.
  10. Low voltage Data line switches - Refer to lighting control system (for compatibility)
- E. Receptacles: Mounting straps and contacts shall be one piece design, constructed of minimum .050" solid brass. Base shall be high strength, heat resistant, glass reinforced nylon. Device shall accept up to #10 wire, side or back wired with screw terminals - no plug-in terminations. Hubbell, Leviton, Pass & Seymore, or equal. Color to be selected by Landscape Architect, unless otherwise noted. Numbers listed below are Hubbell:
1. 20A 3PG 125 volt duplex - No. HBL5362
  2. 20A 3PG 125 volt ground fault interrupter receptacle; GFI receptacles shall conform to the 2006 UL requirements to a) interrupt power to the unit in the event of internal failure, or b) provide an audible or visual indication of internal failure of the GFI; No. GF20 or equal. Through wiring to down stream GFI designated receptacles is not acceptable.

3. 20A 3PG 125 volt half controlled duplex receptacle - No. BR20C1(color), with permanent "controlled" marking, factory applied.
  4. 20A 3PG 125 volt full controlled duplex receptacle - No. BR20C2(color), with permanent "controlled" marking, factory applied.
  5. GFI Module (blank face), no indicator light, 20A - No. GFBF20 or equal.
  6. All receptacles located in exterior or wet locations shall be corrosion resistant with UV stabilized body.
- F. Plates: Leviton, or equal, except as noted:
1. The color of all faceplates shall match the color of the devices installed under/in the faceplate, except as specifically noted otherwise.
  2. For flush outlet boxes, for switches, and receptacles: nylon, color to be selected by Landscape Architect, unless otherwise noted.
  3. Plates for surface-mounted outlets: galvanized steel unless otherwise noted.
  4. Weatherproof duplex receptacle plates for exterior locations with ground fault interrupter receptacles in type FS or FD boxes - Hubbell #WPFS26 or compatible equal. Verify cover compatibility with box type and device installed.
  5. Weatherproof "in-use" cover, vertical or horizontal mount, for exterior with GFCI receptacles. Die-cast metal alloy, TayMac MX series or equal with openings to match installed devices.
  6. Locking plates for duplex receptacles where noted; Pass & Seymour #WP26-L (non-weather proof).
  7. Locking plates for duplex exterior GFCI receptacles (or in wet or damp locations); Heavy duty cast aluminum flush cover with locking latch and key, Pass & Seymour #4600 with appropriate mounting plate for type of device installed. Coordinate backbox requirements and finished wall trim-out with wall installer prior to rough-in to insure an adequate and neat trim appearance upon completion.
  8. Plates for flush tele/data boxes: white nylon or as otherwise directed - provide and install at each tele/data outlet plate to match duplex power outlet plate, for jack installation under Section 27 00 00. Where the power and tele/data outlet boxes are shared the plate shall be continuous in multi-gang locations. See drawings.
- G. Time Clocks: Electronic type with 365 day schedule, holidays, astro-dial, and non-volatile memory back-up.
1. 2-Channel (momentary or maintained contact output) - Tork #DZM200A
  2. 4-Channel (maintained contact output) - Tork #DZS-400A
- H. Equipment Disconnects: All disconnects shall be located to allow proper code required clearance in each area. Locations shown on drawings are diagrammatic only. The contractor shall coordinate exact locations in the field (with other trades) prior to rough-in to insure proper clearances.
1. Motor Disconnect Switches and Safety Switches: General Electric Company Heavy Duty Type "THD", cover interlocked with operating handle so that cover cannot be opened with switch in closed position and switch cannot be closed with cover in open position. 240V or 480V rating, single or multi-pole as required or as noted on drawings, in Nema 1 enclosure indoors or Nema 3R enclosure outdoors unless otherwise noted. Provide dual element motor circuit fuses sized as recommended by equipment manufacturer (for final equipment actually installed).
  2. Code required disconnects: Provide a local disconnect in addition to the branch circuit protection device for all equipment as required by code (whether shown or not). Disconnects shall consist of a motor rated switch (or disconnect) for all motor loads less

than 3/4HP or other suitable disconnect sized to match branch circuit conductors and load current of equipment, with number of poles as required.

- I. Lugs and Connectors: Thomas and Betts "lock-tite", for No. 4 and larger wire; 3M "Scotchlock" fixed spring screw-on type wire connectors with insulator for No. 6 and smaller wire.
  - 1. All splices shall be made up with screw-on type connectors - no plug-in or push-in style connectors acceptable. Wires shall be solidly twisted together with electricians pliers before screw-on connector is installed to ensure a proper connection in the event of wire nut failure. No exceptions.
  - 2. Connectors listed or labeled for "no wire twisting required" are not an acceptable substitute for actual wire twisting.
  - 3. Utilize porcelain type connectors in all high temperature environments (above 105 degrees Celsius).
  
- J. Splice Insulation: "Scotch" electrical tape with vinyl plastic backing or rubber tape with protective friction tape for interior work.
  - 1. Splices in electrical cables of 600 volt insulation class in underground system duct shall be made only in accessible locations such as pullboxes, light pole handholes, etc., using a compression connector on the conductor and by insulating and waterproofing (for exterior and underground locations) by one of the following methods:
    - a. Cast type splice insulation shall be provided by means of a molded casting process employing a thermosetting epoxy resin insulating material which shall be applied by a gravity poured method or by a pressure injected method. The component materials of the resin insulation shall be in a packaged form ready for convenient mixing after removing from the package. Do not allow the cables to be removed until after the splicing material has completely set.
    - b. Gravity poured method shall employ materials and equipment contained in an approved commercial splicing kit which includes a mold suitable for the cables to be applied. When the mold is in place around the joined conductors, the resin mix shall be prepared and poured into the mold. Do not allow cables to be moved until after the splicing materials have completely set.
  
- K. Identification: Refer to Section 26 0500.
  
- L. Firestopping: as manufactured by 3M Fire Protection Products or equal.
  - 1. Fire-rated and smoke barrier construction: Maintain barrier and structural floor fire and smoke resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound vibration absorption, and at other construction gaps.
  - 2. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetration type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall penetrations. Systems or devices must be asbestos free.

**PART 3 - EXECUTION**

**3.01 REFER TO BASIC ELECTRICAL REQUIREMENTS - SECTION 26 0500 FOR WORK UNDER THIS SECTION.**

**3.02 TESTS**

A. Testing and Inspection: See Section 26 0800 - Testing.

**END OF SECTION**

**SECTION 26 5601**  
**SITE LIGHTING**

**PART 1 GENERAL**

**1.01 WORK INCLUDED**

- A. Luminaires
- B. LED's
- C. Power Supplies/Drivers
- D. Poles
- E. Pole bases
- F. Controls and wiring

**1.02 SYSTEM DESCRIPTION**

- A. Furnish all labor, materials, apparatus, tools, equipment transportation, temporary construction and special or occasional services as indicated on the Drawings or described in these Specifications and as required to make a complete working site lighting system.
- B. Illumination levels shall be in accordance with recommendations by the Illuminating Engineering Society (IES).

**1.03 INCORPORATED DOCUMENTS**

- A. Section 26 0500 and Section 26 5101 apply to all work in this Section.

**1.04 SUBMITTALS**

- A. Catalog Information:
  - 1. Luminaire (each type) with photometric pattern.
  - 2. Contactors.
  - 3. Ballast or Driver (each type)
  - 4. Poles.
  - 5. Brackets.
- B. Shop Drawings.
- C. Manufacturer's Recommendations: Provide two copies before material is used.
  - 1. PVC conduit joints and junctions.
  - 2. Solvent welding directions.
  - 3. Pole bases.
- D. Laboratory Test: Determine soil density relationships for compaction of backfill material in accordance with ASTM D1557, Method D.

## **PART 2 PRODUCTS**

### **2.01 MATERIAL AND EQUIPMENT**

- A. Provide new materials and equipment unless otherwise specifically indicated or specified. Materials shall be listed by Underwriter's laboratories, Inc. (U.L.) and bear evidence of such approval where applicable.
- B. Luminaires: Site luminaires shall be weatherproof. Reflectors and refractors shall provide the light configuration indicated and conforming to IES recommendations.
- C. Luminaires and poles shall be finished in epoxy enamel designed to withstand the effects of salt spray. Lens shall be securely attached to the lens frame for security during maintenance and relamping.
- D. Lighting Contactors: NEMA ICS 2. Electrically operated, magnetically held unit in NEMA enclosure, rated poles and ratings as indicated on Drawings. Units shall have silver alloy double breaker contacts and coil clearing contacts and shall require no arcing contacts. On-off selector switch.
- E. Poles, Brackets, Pole Bases and Attachments: Shall be rated for service with wind velocities of 100 mph considering the force exerted by the wind on the maximum exposure of the fixture luminaire selected.
- F. Poles shall be anchor base type round, height and style as indicated, finished to match luminaire, complete with handhole and gasketed cover, anchor bolts with leveling and locking screws, grounding connection, and matching base cover.
- G. Concrete pole bases shall be cast-in-place reinforced concrete as indicated with anchor bolts and conduit entries as per manufacturer. Concrete shall be rated 3,000 PSI at 28 day test.
- H. Concrete:
  - 1. Concrete for electrical requirements shall be at least 3,000 psi concrete with 1-inch maximum aggregate conforming to the requirements of Division 3 for Cast-In-Place concrete.

### **2.02 SOLID STATE LUMINAIRES**

- A. Housing, where applicable:
  - 1. Steel bonderized or equal rust protected, or aluminum, rigid construction. Minimum gauge thickness shall be as follows:
    - a. Interior locations: No. 20-gauge steel, No. 16-gauge aluminum.
- B. Finish:
  - 1. Baked enamel finish (except when otherwise specified).
    - a. Concealed interior surfaces (this applies to interior hardware, circuit boards, etc.) matte black.
    - b. Concealed exterior surfaces: matte black.
    - c. Visible surfaces: color and texture as specified below for each luminaire type or as selected.
    - d. Exterior luminaire finish: refer to Luminaire Schedule.

- C. Light Emitting Diode (LED) requirements:
1. Correlated color temperature (CCT) for phosphor-coated white LEDs must have one of the following designated CCT's and fall within the following binning standards.
    - a. 4000K defined as 3045 +/- 175K
  2. Color spatial uniformity shall be limited to variations in chromaticity for different directions (i.e. changes in viewing angle) within 0.004 from the weighted average point on the CIE 1976 (u',v') diagram.
  3. Color maintenance shall be limited to a maximum change in chromaticity of 0.007 on the CIE 1976 (u',v') diagram over the lifetime of the product.
    - a. Color rendering index: Color rendering index to be determined using ANSI C78.377-2008 and applicable IESNA standards.
    - b. Laboratory tests must be produced using specific module(s)/array(s) and power supply combination that will be used in production.
    - c. Manufacturers must provide a test report from a laboratory accredited by NVLAP or one of its MRA signatories
  4. Lumen depreciation
    - a. Lumen depreciation to be measured using IESNA LM-80-08 standard for IES approved method of measuring lumen maintenance of LED light sources.
    - b. Phosphor coated white LED module(s)/array(s) shall deliver at least 70% of initial lumens for a minimum of 50,000 hours when installed in-situ and operated at 100% output and the maximum specified operating temperature.
    - c. Colored LED module(s)/array(s) shall deliver at least 50% of initial lumens for a minimum of 50,000 hours when installed in-situ and operated at 100% output and the maximum specified operating temperature.
  5. Acceptable LED manufacturers:
    - a. Cree
    - b. Nichia
    - c. Osram Opto Semiconductors
    - d. Philips Lumileds
- D. Luminaire Efficacy:
1. Luminaire efficiency shall be measured using IESNA LM-79-08 standard for electrical and photometric measurements of solid state lighting products.
  2. Manufacturer shall provide published luminaire efficacy, which is defined as luminaire light output divided by luminaire input power measured in a 25 degree Celsius environment. Efficacy shall include power supply, thermal, optical, and luminaire losses.
- E. Thermal Management:
1. Solid state luminaire shall not exceed LED manufacturer's maximum junction temperature requirements when operated in-situ at luminaire manufacturer's maximum ambient operating temperature and 100% light output.
  2. Solid state luminaires shall be thermally protected using one of more of the following thermal management techniques:
    - a. Metal core board
    - b. Gap pad
    - c. Internal monitoring firmware
  3. Solid state luminaire housing shall be designed to transfer heat from the LED board to the outside environment.
- F. Power Supply/Driver requirements:
1. Power factor of 0.90 or greater for primary application



2. Input current shall have Total Harmonic Distortion (THD) of less than 20%.
3. Minimum operating temperature of minus 20 degrees Celsius or below when used in luminaires intended for outdoor applications.
4. Output operating frequency to be equal to or greater than 120 Hz.
5. Operate with sustained input variations of +/- 10% (voltage and frequency) with no damage to the driver.
6. Tolerate sustained open circuit and short circuit output conditions without damage and without need for external fuses or trip devices.
7. Output shall be regulated to +/- 5% across published load range.
8. Class A sound rating.
9. Outputs shall have current limiting protection.
10. Operate LEDs at constant and regulated current levels. LEDs shall not be overdriven beyond the diode manufacturer's specified nominal voltage and current.
11. Inrush currents not exceeding peak currents specified in NEMA 410.

G. Solid State Lighting Controls:

1. Control interface to dimmable power supplies shall consist of one of the following:
  - a. Line Voltage Dimming. Controls to be rated for magnetic or electronic low voltage transformer operation.
  - b. Low voltage (0-10V) control. Controls to be compatible with either current sink or current source operation.
2. Dimmable LED power supplies shall use pulse width modulation (PWM) to regulate power to LEDs
  - a. Dimmable power supplies shall have 12-bit or greater resolution to obtain flicker-free operation throughout the dimming range.

H. System Installation

1. Hardwired connections to solid state luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
2. All solid state luminaires (100% of each lot) shall undergo a minimum eight-hour burn-in test during manufacturing. Solid state lighting installations shall be UL Listed as a low-voltage lighting system including, but not limited to, luminaire, power supply, controller, keypad, and wiring.

I. Warranty

1. Luminaires, drivers, and controllers for solid state lighting systems shall be covered by a five-year warranty against defects in workmanship or material. Warranty shall include in-warranty service program providing for payment of authorized labor charges incurred in replacement of inoperative in-warranty equipment.

## 2.03 LUMINAIRE CONSTRUCTION

- A. Sheet metal: materials and thicknesses shall be 20 gauge (0.7 mm or 0.027") min., free of dents, scratches, oil-can, or other defects.
- B. Painted luminaires: exposed weld marks, joints, and seams shall be filled and sanded smooth before finishing.
- C. All edges cleaned and dressed to remove sharp edges or burrs.

- D. Extrusions: 1/10" min. wall thickness, smooth and free of tooling lines, with cast end plates that exactly match extrusion profiles.
- E. Castings: smooth, free of pits, scales, gate marks, or blemishes.
- F. Spinings shall have 1/32" min. thickness, smooth, free of spinning lines or blow-back, with clean edges.
- G. Welds: Follow recommendations of American Welding Society. All welds continuous and free of spatter, residue, or warping.
- H. No light leaks visible. Field paint exterior of housing with high temperature paint if necessary.
- I. Exposed end plates and joiners, with concealed fasteners.
- J. Hardware:
  - 1. Steel or aluminum exterior luminaires: stainless steel hardware.
  - 2. Stainless steel luminaires: stainless steel hardware.
  - 3. Copper alloy luminaires: brass hardware.
- K. Raceways: Where used for through wiring, luminaires must be approved for use as raceways.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Refer to Section 26 27 00, Part 2.02, for wiring and splicing requirements.
- B. Underground cable installation shall conform to National Electrical Code except as otherwise specified or indicated.
- C. Contractor Damage: The Contractor shall promptly cause repairs to be made to any indicated utility lines or systems damaged by his operation.
- D. Under roads and paved areas, ducts shall be EPC-80-PVC polyvinyl chloride conduit.
- E. Cables shall be in one piece without splices between connections except where the distance exceeds the lengths in which the cable is furnished.
- F. Bends in cables shall have an inner radius of not less than 12 times the cable diameter.
- G. Horizontal slack of approximately 3 feet shall be left in the ground on each end of cable runs, on each side of connection and at all points where connections are to be made above ground level.
- H. Earthwork: Earthwork for electrical requirements shall conform to the requirements of Division 31.
- I. Coordinate work with other trades. Pre-ship anchor bolts and templates for use in preparing bases for installation. After leveling luminaires, pack grout between mounting plate and concrete footing. Provide weep holes to prevent accumulation of moisture inside pole base.

### 3.02 TESTS

- A. Test under provisions of Division 1, Section 26 0800, and Section 26 5101.
- B. The Engineer shall be notified at least three working days in advance of the Contractor's proposed date of the tests to permit scheduling, and to permit witnessing of the tests. The Contractor shall furnish the Engineer with three copies of the results of the tests.
- C. Circuits: The Contractor shall test each circuit, all controllers, and components of the system for proper operation. The Contractor shall furnish the Engineer with three copies of the test results.
- D. Compaction Tests: Backfill shall be tested for compaction in accordance with ASTM D1556.
- E. Operating Test: Contractor shall operate the system in the presence of the Engineer proving the proper operation.

**END OF SECTION**

## SECTION 32 1000

### EARTHWORK

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. This Section includes the following:
  - 1. Excavation and/or embankment from existing ground to subgrade, including soil sterilant, for roadways, driveways, parking areas, walks, paths, or trails and any other site improvements called for on the Plans.
- B. Related Sections include the following:
  - 1. Section 31 2333, Trenching and Backfill.
  - 2. Section 32 1000, Base Courses.
  - 3. Section 31 1216, Asphalt Paving.
- C. Related Sections exclude the following:
  - 1. Earthwork related to underground utility installation, see Section 310000.

##### 1.02 RELATED DOCUMENTS

- A. Geotechnical Design Recommendations – East Washington Park – Phase 2, Prepared by Miller Pacific Engineering Group, Dated January 10, 2020
- B. Geotechnical Investigation – East Washington Park, Prepared by Miller Pacific Engineering Group, Dated September 30, 2008.
- C. City of Petaluma Design and Construction Standards
- D. Petaluma standard specifications
- E. ASTM:
  - 1. D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
  - 2. D 1586, Method for Penetration Tests and Split-Barrel Sampling of Soils.
  - 3. D 2487, Classification of Soils for Engineering Purposes.
  - 4. D 3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
  - 5. D 4318. Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
  - 6. E 329, Specification for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
  - 7. E 548, Guide for General Criteria Used for Evaluating Laboratory Competence.
- F. California Building Code, California Code of Regulations, Title 24, Part 2, Chapter 33, Site Work, Demolition and Construction.
- G. Caltrans Standard Specifications, latest edition:
  - 1. Section 17, Watering.
  - 2. Section 19, Earthwork.
- H. CAL/OSHA, Title 8.

##### 1.03 DEFINITIONS

- A. Borrow: Approved soil material imported from off-site for use as Structural Fill or Backfill.
- B. Excavation: Removal of material encountered above subgrade elevations.
  - 1. Authorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions as shown on plans or authorized by the Geotechnical Consultant.
  - 2. Unauthorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions without authorization by the Geotechnical Consultant. Unauthorized excavation shall be without additional compensation.
- C. Structural Fill: Soil materials approved by the Geotechnical Consultant and used to raise existing grades.
- D. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material  $\frac{3}{4}$ -cubic yards or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows/2-inches.
- E. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below grade.
- F. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, base or topsoil materials.
- G. Unsuitable Material: Any soil material that is not suitable for a specific use on the Project. The Geotechnical Consultant will determine if a soil material is unsuitable.
- H. Utilities: onsite underground pipes, conduits, ducts and cables.

#### 1.04 SUBMITTALS

- A. Follow submittal procedure outlined by Engineer.
- B. Samples:
  - 1. If required by the Geotechnical Consultant, provide 40-pound samples sealed in airtight containers, tagged with source locations and suppliers of each proposed soil material from on-site or borrow sources. Do not import materials to the Project without written approval of the Geotechnical Consultant.
  - 2. Provide materials from same source throughout work. Change of source requires approval of the Geotechnical Consultant.
  - 3. Classification according to ASTM D 2487 of each onsite or borrow soil material proposed for fill and backfill.
  - 4. Laboratory compaction curve in conformance with ASTM D 1557 for each onsite or borrow soil material proposed for fill and backfill.

#### 1.05 QUALITY ASSURANCE

- A. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Consultant.
- B. Conform all work to the appropriate portion(s) of Caltrans Standard Specifications, Section 17 and 19.
- C. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.
- D. Perform excavation, filling, compaction and related earthwork under the observation of the Geotechnical Consultant. Materials placed without approval of the Geotechnical Consultant will be presumed to be defective and, at the discretion of the Geotechnical Consultant, shall be removed and replaced at no cost

to the City. Notify the Geotechnical Consultant at least 24-hours prior to commencement of earthwork and at least 48 hours prior to testing.

- E. The Geotechnical Consultant will perform observations and tests required to enable him to form an opinion of the acceptability of the Project earthwork. Correct earthwork that, in the opinion of the Geotechnical Consultant, does not meet the requirements of these Technical Specifications and the Geotechnical Report.
- F. Upon completion of the construction work, certify that all compacted fills and foundations are in place at the correct locations, and have been constructed in accordance with sound construction practice. In addition, certify that the materials used are of the types, quality and quantity required by these Technical Specifications and the Geotechnical Report. The Contractor shall be responsible for the stability of all fills and backfills constructed by his forces and shall replace portions that in the opinion of the Geotechnical Consultant have been displaced or are otherwise unsatisfactory due to the Contractor's operations.
- G. Finish subgrade tolerance at completion of grading:
  - 1. Building and paved areas:  $\pm 0.05$
  - 2. Other areas:  $\pm 0.10$  feet.

## 1.06 PROJECT CONDITIONS

- A. Promptly notify the Engineer of surface or subsurface conditions differing from those disclosed in the Geotechnical Report. First notify the Engineer verbally to permit verification and extent of condition and then in writing. No claim for conditions differing from those anticipated in the Contract Documents and disclosed in the Geotechnical Report will be allowed unless the Contractor has notified the Engineer in writing of differing conditions prior to the Contractor starting work on affected items.
- B. Protect open excavations, trenches, and the like with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.
- C. Contractor shall comply with the Sonoma Countywide Water Pollution Prevention Program and follow the Best Management Practices (BMP's) during construction activities.
- D. Prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.
- E. Temporarily stock-pile fill material in an orderly and safe manner and in a location approved by the Engineer. Stockpiles of soil, sand and debris and the fill material in trucks for hauling soil shall be covered to prevent them from being blown away by the wind.
- F. Provide dust and noise control in conformance with the County of Sonoma Standards. Contractor shall assume liability for all claims related to windblown dust and dirt. Water shall be applied in conformance with applicable provisions of Section 17 of the Caltrans Standard Specifications and with Section 1590 (e) of CAL/ OSHA, Title 8.
- G. Environmental Requirements: When unfavorable weather conditions necessitate interrupting earthwork operation, areas shall be prepared by compaction of surface and grading to avoid collection of water. Provide adequate temporary drainage to prevent erosion. After interruption, compaction specified in last layer shall be re-established before resuming work.

## PART 2 PRODUCTS

### 2.01 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from on-site excavations.
- B. Obtain approval of on-site soil materials and borrow materials to be used for structural fill or structural backfill from the Geotechnical Consultant.
- C. On-Site Structural Fill and Structural Backfill: Soil or soil-rock mixture from on site excavations, free of deleterious substances. On-site structural fill and backfill shall be in accordance with the recommendations of the project geotechnical report.
- D. Imported Structural Fill and Structural Backfill: Conform to the requirements of on-site structural fill.

### **PART 3 EXECUTION**

#### **3.01 GENERAL**

- A. Conform to Section 19, Earthwork, Caltrans Standard Specifications as modified by the Contract Documents.
- B. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.
- C. The use of explosives will not be permitted.

#### **3.02 CONTROL OF WATER AND DEWATERING**

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding the site and surrounding area. Provide dewatering equipment necessary to drain and keep excavations and site free from water.
- B. Dewater during backfilling operation so that groundwater is maintained a least one foot below level of compaction effort.
- C. Obtain the Geotechnical Consultant's approval for proposed control of water and dewatering methods.
- D. Protect subgrades from softening, undermining, washout and damage by rain or water accumulation.
- E. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations.
- F. Maintain dewatering system in place until dewatering is no longer required.

#### **3.03 WET WEATHER CONDITIONS**

- A. Do not prepare subgrade, place or compact soil materials if subgrade or materials are above optimum moisture content.
- B. If the Geotechnical Consultant allows work to continue during wet weather conditions, conform to supplemental recommendations provided by the Geotechnical Consultant.

#### **3.04 BRACING AND SHORING**

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the facility being

constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.

- C. Be solely responsible for all bracing and shoring and, if requested by the Engineer, submit details and calculations to the Engineer. The Engineer may forward the submittal to the Geotechnical Consultant, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations related to the proposed facility shall precede a response to the submittal by the Engineer.
- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the position or operation of the facility being constructed or adjacent utilities and facilities.

### **3.05 EXCAVATION**

- A. Excavate earth and rock to lines and grades shown on drawings and to the neat dimensions indicated on the Plans, required herein or as required to satisfactorily compact backfill.
- B. Remove and dispose of large rocks, pieces of concrete and other obstructions encountered during excavation.
- C. Where forming is required, excavate only as much material as necessary to permit placing and removing forms.
- D. Provide supports, shoring and sheet piles required to support the sides of excavations or for protection of adjacent existing improvements.

### **3.06 REMOVAL OF EXISTING FILLS AND UNSUITABLE MATERIAL**

- A. Over-excavate areas of existing fills and other unsuitable material encountered during mass grading as directed by the Geotechnical Consultant.
- B. Compensation for increased removal widths and depths that are not required by the Geotechnical Consultant will not be considered, except when such increase is necessary for protection of life and property as determined by and approved by the Engineer.
- C. The Geotechnical Consultant will provide written approval for each excavation prior to placement of fill. Allow adequate time after excavation and before filling for the Geotechnical Consultant's review and written approval and, if necessary, time for the Engineer to conduct as built survey prior to placing fill. Basis for calculating the quantity of material excavated or placed may be the difference between the grading shown on the Plan and an as built survey of the grading.

### **3.07 GRADING**

- A. Uniformly grade the Project to the elevations shown on plans
- B. Finish ditches, gutters and swales to the sections, lines and grades indicated and to permit proper surface drainage.
- C. Round tops and bottoms of slopes as indicated or to blend with existing contours.

### **3.08 SUBGRADE PREPARATION**



- A. Install underground utilities and service connections prior to final preparation of subgrade and placement of base materials for final surface facilities. Extend services so that final surface facilities are not disturbed when service connections are made.
- B. Prepare subgrades under the structural section of paved areas, curbs, gutters, walks, structures, other surface facilities and areas to receive structural fill.
- C. Prepare subgrades for the structural section of paved areas, curbs and gutters by plowing or scarifying surface at least 8 inches below final subgrade elevations and 5-feet beyond edge of pavement unless specified otherwise by the Geotechnical Consultant. Uniformly moisture condition to obtain optimum moisture contents. Break clods and condition surface by harrowing or dry rolling. Remove boulders, hard ribs and solid rock. Prepare earth uniform for full depth and width of subgrade.
- D. Protect utilities from damage during compaction of subgrades and until placement of final pavements or other surface facilities.
- E. Obtain the Geotechnical Consultant's approval of subgrades prior to placing pavement structural section.

### **3.09 PLACEMENT OF STRUCTURAL FILL**

- A. Obtain the Geotechnical Consultant's approval of surface to receive structural fill prior to placement of structural fill material.
- B. Place structural fill on prepared subgrade.
- C. Spread structural fill material in uniform lifts in accordance with the recommendations of the project geotechnical report.
- D. Place structural fill material to suitable elevations above grade to provide for anticipated settlement and shrinkage.
- E. Overbuild fill slopes, as required by the Geotechnical Consultant, to obtain required compaction. Remove excess material to lines and grades indicated.
- F. Do not drop fill on structures. Do not backfill around, against or upon concrete or masonry structures until structure has attained sufficient strength to withstand loads imposed and the horizontal structural system had been installed.

### **3.010 KEYWAYS AND BENCHES**

- A. Provide keyways as indicated for fill slopes steeper than 6 horizontal to 1 vertical. Extend keyway 5-feet minimum into competent, undisturbed soil or 3-feet minimum into competent, undisturbed rock as directed by the Geotechnical Consultant.
- B. Place subsurface drains in bottom of keyway in conformance with provisions of the project geotechnical report.
- C. Bench subgrade as indicated above toe of fill.
- D. Place subsurface drains at benches every 20 vertical feet or as directed by the Geotechnical Consultant.

### **3.011 COMPACTION AND TESTING**

- A. Do not compact by ponding, flooding or jetting.

- B. Compact soils at optimum water content. Aerate material if it is too wet. Add water to material if it is too dry. Thoroughly mix lifts before compaction to ensure uniform moisture distribution.
- C. Perform compaction using rollers, pneumatic or vibratory compactors or other equipment and mechanical methods approved by the Geotechnical Consultant.
- D. Compaction requirements:
  - 1. Compact structural fills in accordance with the project geotechnical report recommendations.
  - 2. Compact the upper 6 inches of subgrade soils beneath pavements, curbs and gutters to 95 percent relative compaction. Extend compaction 5-feet beyond pavement edges unless specified otherwise by the Geotechnical Consultant.
  - 3. Compact the upper 6-inches of subgrade soils under walks to 95 percent compaction.

### **3.012 DISPOSAL**

- A. Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the City.

**END OF SECTION**

**SECTION 31 2333**

**TRENCHING AND BACKFILL**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Excavation, bedding, and backfill of underground storm drain, sanitary sewer and water piping and associated structures.
- B. This Section excludes the following:
  - 1. Drainage fill material and placement around subdrains.
  - 2. Trenching and backfill for other utilities such as underground electric, telephone, gas, cable TV, etc.
- C. Related sections include the following:
  - 1. Section 31 0000, Earthwork.
  - 2. Section 33 4000, Storm Drainage Utilities.

**1.02 RELATED DOCUMENTS**

- A. Geotechnical Design Recommendations - East Washington Park - Phase 2, Prepared by Miller Pacific Engineering Group, Dated January 10, 2020
- B. Geotechnical Investigation - East Washington Park, Prepared by Miller Pacific Engineering Group, Dated September 30, 2008.
- C. City of Petaluma Design and Construction Standards
- D. Petaluma standard specifications
- E. ASTM:
  - 1. C 33, Specification for Concrete Aggregates.
  - 2. C 150, Specification for Portland Cement.
  - 3. C 260, Specification for Air-Entraining Admixtures for Concrete.
  - 4. C 618, Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
  - 5. D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
  - 6. D 2321, Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
  - 7. D 2487, Classification of Soils for Engineering Purposes.
  - 8. D 3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
  - 9. E 329, Specification for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
  - 10. E 548, Guide for General Criteria Used for Evaluating Laboratory Competence.
- F. California Building Code, California Code of Regulations, Title 24, Part 2 - Chapter 18, Foundations, and Retaining Walls, and Chapter 33, Site Work, Demolition and Construction.
- G. Caltrans Standard Specifications, latest edition:
  - 1. Section 19, Earthwork.

2. Section 26, Aggregate Bases.
3. Section 68, Subsurface Drains.
4. Section 88, Engineering Fabrics.

H. CAL/OSHA, Title 8.

### 1.03 DEFINITIONS

- A. AC: Asphalt Concrete.
- B. ASTM: American Society for Testing and Materials.
- C. Bedding: Material from bottom of trench to bottom of pipe.
- D. CDF: Controlled Density Fill.
- E. DIP: Ductile Iron Pipe.
- F. Initial Backfill: Material from bottom of pipe to 12-inches above top of pipe.
- G. PCC: Portland Cement Concrete.
- H. RCP: Reinforced Concrete Pipe.
- I. Springline of Pipe: Imaginary line on surface of pipe at a vertical distance of  $\frac{1}{2}$  the outside diameter measured from the top or bottom of the pipe.
- J. Subsequent Backfill: Material from 12-inches above top of pipe to subgrade of surface material or subgrade of surface facility or to finish grade.
- K. Trench Excavation: Removal of material encountered above subgrade elevations and within horizontal trench dimensions.
  1. Authorized Trench Over-Excavation: Excavation below trench subgrade elevations or beyond indicated horizontal trench dimensions as shown on plans or authorized by the Geotechnical Consultant.
  2. Unauthorized Trench Over-Excavation: Excavation below trench subgrade elevations or beyond indicated horizontal trench dimensions without authorization by the Geotechnical Consultant. Unauthorized excavation shall be without additional compensation.
- L. Utility Structures:
  1. Storm drainage manholes, catch basins, drop inlets, curb inlets, vaults, etc.
  2. Sanitary sewer manholes, vaults, etc.
  3. Water vaults, etc.

### 1.04 SUBMITTALS

- A. Follow submittal procedure outlined by the Engineer.
- B. Product Data:
  1. Grading and quality characteristics showing compliance with requirements for the Work.
  2. Certify that material meets requirements of the Project.
- C. Samples:
  1. If required by the Geotechnical Consultant, provide 40-pound samples of all imported trench bedding and backfill material sealed in airtight containers, tagged with source locations and suppliers of each proposed material. Do not import materials to Project without written approval of the Geotechnical Consultant.

2. Provide materials from same source throughout work. Change of source requires approval of the Geotechnical Consultant and the Engineer.

#### **1.05 QUALITY ASSURANCE**

- A. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Consultant.
- B. Conform all work to the appropriate portion(s) of the Caltrans Standard Specifications, Section 19.
- C. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.
- D. The Geotechnical Consultant will perform observations and tests required to enable him to form an opinion of the acceptability of the trench backfill. The observation may also be performed by the City of Petaluma Authorized Inspector or Engineer. Correct the trench backfill that, in the opinion of the Geotechnical Consultant, does not meet the requirements of these Technical Specifications and the Geotechnical Report.

#### **1.06 PROJECT CONDITIONS**

- A. Promptly notify the Engineer of surface or subsurface conditions differing from those disclosed in the Geotechnical Report. First notify the Engineer verbally to permit verification and extent of condition and then in writing. No claim for conditions differing from those anticipated in the Contract Documents and disclosed in the Geotechnical Report will be allowed unless Contractor has notified the Engineer in writing of differing conditions prior to contractor starting work on affected items.
- B. Protect open, trenches, and utility structure excavations with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.
- C. Stockpile on-site and imported backfill material temporarily in an orderly and safe manner.
- D. Provide dust and noise control in conformance with County of Sonoma standards.

### **PART 2 PRODUCTS**

#### **2.01 PIPE BEDDING AND INITIAL BACKFILL**

- A. ASTM D 2321, Class II.
  1. Clean and free of clay, silt or organic matter.
- B. Permeable Material: Conform to Section 68-1.025 of Caltrans Standard Specifications, Class 2.
- C. Class 2 Aggregate Base: Conform to Section 26 of Caltrans Standard Specifications, 3/4-inch maximum.
- D. Sand: Conform to Section 19-3.025B of Caltrans Standard Specifications.

#### **2.02 WARNING TAPE**

- A. Install in accordance with City of Petaluma plans and standards.

#### **2.03 SUBSEQUENT BACKFILL**

- A. Conform to on-site or imported structural backfill in Section 310000, Earthwork.

#### **2.04 CONTROLLED DENSITY FILL (CDF) (in trenches)**

- A. Provide non-structural CDF, from bottom of trench to finish subgrade of subbase or base material, that can be excavated by hand and produce unconfined compressive 28-day strengths from 50-psi to a maximum of 150-psi. Provide aggregate no larger than 3/8-inch top size. The 3/8-inch aggregate shall not comprise more than 30% of the total aggregate content.
- B. Cement: Conform to the standards as set forth in ASTM C-150, Type II Cement.
- C. Fly Ash: Conform to the standards as set forth in ASTM C-618, for Class F pozzolan. Do not inhibit the entrainment of air with the fly ash.
- D. Air Entraining Agent: Conform to the standards as set forth in ASTM C-260.
- E. Aggregates need not meet the standards as set forth in ASTM C-33. Any aggregate, producing performances characteristics described herein will be accepted for consideration. The amount of material passing a #200 sieve shall not exceed 12% and no plastic fines shall be present.
- F. Provide CDF that is a mixture of cement, Class F pozzolan, aggregate, air entraining agent and water. CDF shall be batched by a ready mixed concrete plant and delivered to the job site by means of transit mixing trucks.
- G. The Contractor shall determine the actual mix proportions of the controlled density fill to meet job site conditions, minimum and maximum strengths, and unit weight. Entrained air content shall be a minimum of 4.0%. The actual entrained air content shall be established for each job with the materials and aggregates to be used to meet the placing and unit weight requirements. Entrained air content may be as high as 20% for fluidity requirements.
- H. Mix design shall meet the Geotechnical Consultant's approval.

#### **2.05 CONCRETE STRUCTURE BEDDING AND BACKFILL**

- A. Precast Structures: Same materials to the same heights as specified for pipe bedding and backfill, or other material approved by the Geotechnical Consultant.
- B. Poured-in-Place Structures:
- C. Bedding: Bedding shall meet the approval of the Geotechnical Consultant. In general, bedding is not required, pour bases against undisturbed native earth in cut areas and against engineered fill compacted to 90% relative compaction in embankment areas.

#### **2.06 FILTER FABRIC**

- A. Filter Fabric:
  - 1. Filter Fabric: Section 88-1.03 of Caltrans Standard Specifications.
  - 2. Mirifi 140N (Mirifi Inc., Charlotte, NC) (Tel. 800-438-1855) or equal.

### **PART 3 EXECUTION**

#### **3.01 TRENCHING AND EXCAVATION**

- A. Existing PCC or AC Areas: Cut PCC or AC to full depth at a minimum distance of 12-inches beyond the edge of the trench.

- B. Excavate by hand or machine. For gravity systems begin excavation at the outlet end and proceed upstream. Excavate sides of the trench parallel and equal distant from the centerline of the pipe. Hand trim excavation. Remove loose matter.
- C. Excavation Depth for Bedding: Minimum of 4-inches below bottom of pipe or as otherwise allowed or required by the Geotechnical Consultant, except that bedding is not required for nominal pipe diameters of 2-inches or less.
- D. Excavation Width at Springline of Pipe:
  - 1. Up to a nominal pipe diameter of 24-inches: Minimum of twice the outside pipe diameter, or as otherwise allowed or required by the Geotechnical Consultant.
- E. Over-Excavations: Backfill trenches that have been excavated below bedding design subgrade, with approved bedding material.
- F. Comply with the Engineer's limitations on the amount of trench that is opened or partially opened at any one time. Do not leave trenches open overnight without the approval of the Engineer.
- G. Where forming is required, excavate only as much material as necessary to permit placing and removal of forms.
- H. Bottoms of trenches will be subject to testing by Geotechnical Consultant. Correct deficiencies as directed by the Geotechnical Consultant.
- I. Grade bottom of trench to provide uniform thickness of bedding material and to provide uniform bearing and support for pipe along entire length. Remove stones to avoid point bearing.

### **3.02 CONTROL OF WATER AND DEWATERING**

- A. Be solely responsible for dewatering trenches and excavations and subsequent control of ground and surface water. Provide and maintain such pumps or other equipment as may be necessary to control ground water and seepage to the satisfaction of the Geotechnical Consultant and the Engineer until backfilling is completed.
- B. Dewater during backfilling operation so that groundwater is maintained a least one foot below level of compaction effort.
- C. Obtain the Geotechnical Consultant's approval for proposed control of water and dewatering methods.
- D. Reroute surface water runoff away from open trenches and excavations. Do not allow water to accumulate in trenches and excavations.
- E. Maintain dewatering system in place until dewatering is no longer required.

### **3.03 BRACING AND SHORING**

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the pipes and appurtenances being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.
- C. Be solely responsible for all bracing and shoring and, if requested by the Engineer, submit details and calculations to the Engineer. The Engineer may forward the submittal to the Geotechnical Consultant, the Consulting Engineer and/or the California Division of Industrial Safety for their

review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations in trench section or around structures shall precede a response to the submittal by the Engineer.

- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the line, grade, or backfill compaction or operation of the utility being installed or adjacent utilities and facilities.

### **3.04 PIPE BEDDING**

- A. Obtain approval of bedding material from the Geotechnical Consultant.
- B. Accurately shape bedding material to the line and grade called for on the Plans. Carefully place and compact bedding material to the elevation of the bottom of the pipe in layers not exceeding 8-inches in loose thickness. Compact bedding material at optimum water content to 90% relative compaction unless specified otherwise on the Plans or by the Geotechnical Consultant. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Consultant. Jetting or ponding of bedding material will not be permitted.
- C. Upon completion of bedding operations, and prior to the installation of pipe, notify the Geotechnical Consultant, who will inspect the bedding layer. Do not commence pipe laying until the Geotechnical Consultant has approved the bedding.

### **3.05 WARNING TAPE**

- A. Install in accordance the City of Petaluma plans and standards.

### **3.06 BACKFILLING**

- A. Obtain approval of backfill material from Geotechnical Consultant.
- B. Bring initial backfill up simultaneously on both sides of the pipe, so as to prevent any displacement of the pipe from its true alignment. Carefully place and compact initial backfill material to an elevation of 12-inches above the top of the pipe in layers not exceeding 8-inches in loose thickness. Compact initial backfill material at optimum water content to 90% relative compaction unless specified otherwise on the Plans or by the Geotechnical Consultant. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Consultant. Jetting or ponding of initial backfill material will not be permitted.
- C. Bring subsequent backfill to subgrade or finish grade as indicated. Carefully place and compact subsequent backfill material to the proper elevation in layers not exceeding 8-inches in loose thickness. Compact subsequent backfill material at optimum water content in accordance with City of Petaluma Standard Details and Specifications, unless specified otherwise by the Geotechnical Consultant or the City Authorized Inspector or Engineer. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Consultant. Jetting or ponding of subsequent backfill material will not be permitted.
- D. Do not use compaction equipment or methods that produce horizontal or vertical earth pressures which may cause excessive pipe displacement or damage the pipe.
- E. Utility backfill shall be inspected and tested by the Geotechnical Consultant during placement. Cooperate with the Geotechnical Consultant and provide working space for such tests in operations. Backfill not compacted in accordance with these specifications shall be re-compacted



or removed as necessary and replaced to meet the specified requirements, to the satisfaction of the Geotechnical Consultant and the Engineer prior to proceeding with the Project.

**3.07 CLEANUP**

- A. Upon completion of utility earthwork all lines, manholes catch basins, inlets, water meter boxes and other structures shall be thoroughly cleaned of dirt, rubbish, debris and obstructions of any kind to the satisfaction of the Engineer.

**END OF SECTION**

**SECTION 32 1000**

**BASE COURSES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Aggregate subbase and base.
  - 2. Cement treated base.
  - 3. Lime stabilization.
- B. Related Sections include the following:
  - 1. Section 31 0000, Earthwork.
  - 2. Section 31 2333, Trenching and Backfill.
  - 3. Section 32 1216, Asphalt Paving.

**1.02 RELATED DOCUMENTS**

- A. Geotechnical Design Recommendations – East Washington Park – Phase 2, Prepared by Miller Pacific Engineering Group, Dated January 10, 2020
- B. Geotechnical Investigation – East Washington Park, Prepared by Miller Pacific Engineering Group, Dated September 30, 2008.
- C. City of Petaluma Design and Construction Standards
- D. Petaluma standard specifications Caltrans Standard Specifications, latest edition:
  - 1. Section 24, Lime Stabilization.
  - 2. Section 25, Aggregate Subbases.
  - 3. Section 26, Aggregate Bases.
  - 4. Section 27, Cement Treated Bases.
- E. AASHTO:
  - 1. M147- Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; American Association of State Highway and Transportation Officials; 1965 (2004).
  - 2. M180- Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in) Drop; American Association of State Highway and Transportation Officials; 2001 (2004).
- F. ASTM:
  - 1. C 136, Standard Test Method for Sieve Analysis of Fine and Course Aggregates, 2005.
  - 2. D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
  - 3. D 2922, Standard Test Method for Density of Soil and Soil-Aggregate in place by Nuclear Methods (Shallow Depth); 2004
  - 4. D 3017, Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2004
  - 5. D 3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
  - 6. E 329, Specification for minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
  - 7. E 548, Guide for General Criteria Used for Evaluating Laboratory Competence.

### **1.03 DEFINITIONS**

- A. ASTM: American Society for Testing Materials.

### **1.04 SUBMITTALS**

- A. Follow submittal procedure outlined by the Engineer.
- B. Submit material certificates signed by the material producer and the Contractor, certifying that that each material item complies with, or exceeds the specified requirements.

### **1.05 QUALITY ASSURANCE**

- A. Do not mix or place cement treated base when the temperature is below is below 36 degrees F or when the ground is frozen.
- B. Conform to the appropriate portions of the Geotechnical Report, these Specifications and Section 19 of Caltrans Standard Specifications.
- C. Finish surface of the prepared subgrade to receive aggregate subbase, aggregate base or cement treated base, shall be as specified in Section 31 0000.
- D. Finish surface of material to be stabilized prior to lime treatment shall be as specified in Section 24-1.04 of Caltrans Standard Specifications.
- E. Finish surface of the stabilized material after lime treatment shall be as specified in Section 24-1.08 of Caltrans Standard Specifications.
- F. Do not project the finish surface of aggregate subbase above the design subgrade.
- G. Finish surface of aggregate base shall be 0 to - 0.05-feet.
- H. Finish surface of cement treated base shall be as specified in Section 27 of Caltrans Standard Specifications.
- I. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM Designation D1557.

## **PART 2 PRODUCTS**

### **2.01 FILL MATERIAL**

- A. If fill material is required to restore the previously constructed subgrade to its proper elevation, provide structural fill material specified in Section 31 0000.

### **2.02 AGGREGATE SUBBASE**

- B. Material: Caltrans Standard Specification Section 25.
  - 1. Class 2: Section 25-1.02A.

### **2.03 AGGREGATE BASE**

- A. Material: Caltrans Standard Specification Section 26.
  - 1. Class 2, 3/4-inch Maximum: Section 26-1.02A.

## **PART 3 EXECUTION**

**3.01 GENERAL**

- A. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.

**3.02 WET WEATHER CONDITIONS**

- A. Do not place or compact subgrade if above optimum moisture content.
- B. If the Geotechnical Consultant allows work to continue during wet weather conditions, conform to supplemental recommendations provided by the Geotechnical Consultant.

**3.03 AGGREGATE SUBBASE**

- A. Spreading and Compacting: Sections 25-1.04 and 25-1.05 of Caltrans Standard Specifications.

**3.04 AGGREGATE BASE**

- A. Watering, Spreading and Compacting: Section 26-1.035, 26-1.04 and 26-1.05 of Caltrans Standard Specifications.

**END OF SECTION**



**SECTION 32 1216**  
**ASPHALT PAVING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Prime coat.
  - 2. Tack coat.
  - 3. Asphalt concrete paving.
- B. Related Section include the following:
  - 1. Section 32 1000, Base Courses.

**1.02 RELATED DOCUMENTS**

- C. Geotechnical Design Recommendations – East Washington Park – Phase 2, Prepared by Miller Pacific Engineering Group, Dated January 10, 2020
- D. Geotechnical Investigation – East Washington Park, Prepared by Miller Pacific Engineering Group, Dated September 30, 2008.
- E. City of Petaluma Design and Construction Standards
- F. Petaluma standard specifications
- G. ASTM: Petaluma standard specifications
  - 1. D 979: Practice for Sampling Bituminous Paving Mixtures.
  - 2. D 1073: Specification for Fine Aggregate for Bituminous Paving Mixtures.
  - 3. D 1188: Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens.
  - 4. D 2041: Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
  - 5. D 2726: Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
  - 6. D 2950: Test Method for Density of Bituminous Concrete in Place by Nuclear Method.
  - 7. D 3549: Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
  - 8. D 3666: Specifications for Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Mixtures.
- H. Caltrans Standard Specifications, latest edition.
  - 1. Section 39: Asphalt Concrete.
  - 2. Section 88: Engineering Fabrics.
  - 3. Section 92: Asphalts.
  - 4. Section 93: Liquid Asphalts.
  - 5. Section 94: Asphaltic Emulsions.

**1.03 DEFINITIONS**

- A. ASTM: American Society for Testing Materials.

#### 1.04 QUALITY ASSURANCE

- A. Testing Agency: Engineer will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
  - 1. Testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from specified requirements.
- B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- C. Thickness of Asphalt Concrete: In-place compacted thickness of asphalt courses will be determined according to ASTM D 3549.
- D. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.
  - 1. Reference maximum theoretical density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
  - 2. In-place density of compacted pavement may be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
  - 3. One core sample may be taken for every 1000 sq. yd. or less of installed pavement, but in no case will fewer than 3 cores be taken.
  - 4. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

#### 1.05 SUBMITTALS

- A. Follow submittal procedure outlined by the Engineer.
- B. Job-Mix Designs: Certificates signed by manufacturers certifying that each asphalt concrete mix complies with requirements.
- C. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

#### 1.06 PROJECT CONDITIONS

- A. Environmental Limitations:
  - 1. Prime Coat: Minimum surface temperature of 60 deg F at application.
  - 2. Tack Coat: Minimum surface temperature of 60 deg F at application.
  - 3. Asphalt Concrete: Minimum atmospheric temperature of 50 deg F at application.
  - 4. Reinforcing Fabric: Air temperature is 50 deg F and rising and pavement temperature is 40 deg F and rising.

### PART 2 PRODUCTS

#### 2.01 ASPHALT CONCRETE

- A. Caltrans Standard Specifications Section 39, Type A, 1/2-inch Maximum, Medium.

- B. Asphalt Materials:
  - 1. Asphalt Binder: Performance Graded in accordance with Caltrans Standard Specification Section 92.
  - 2. Prime Coat: Caltrans Standard Specification Section 93, MC-70.
  - 3. Tack Coat: Caltrans Standard Specification Section 94, SS1 or SS1h.
- C. Aggregates: Conform to Caltrans Standard Specification Section 39-2.02.
- D. Storing, Proportioning and Mixing Materials: Caltrans Standard Specification Section 39-3.
- E. Pavement Reinforcing Fabric: Caltrans Standard Specification Section 88.
- F. Sand: ASTM D 1073, Grade No. 2 or 3.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll subbase using heavy pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Notify Engineer in writing of any unsatisfactory conditions. Do not begin paving until these conditions have been satisfactorily corrected.

#### **3.02 SURFACE PREPARATION FOR AGGREGATE BASE MATERIALS**

- A. General: Immediately before placing asphalt materials remove loose and deleterious material from substrate surfaces and ensure that prepared subgrade is ready to receive paving according to the Caltrans Standard Specification Section 39-4.01.
- B. Prime Coat: Apply uniformly over surface of compacted-aggregate base according to the Caltrans Standard Specification Section 39-4.02. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 24 hours minimum.
  - 1. If prime coat is not entirely absorbed within 8 hours after application, spread excess prime coat with hand tools and broadcast sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  - 2. Protect primed substrate from damage until ready to receive paving.
- C. Tack Coat: Apply uniformly to all vertical surfaces against which asphalt concrete is to be placed, including existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new asphalt pavement, according to the Caltrans Standard Specification Section 39-4.02.
  - 1. Allow tack coat to cure undisturbed before paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

#### **3.03 PAVEMENT REINFORCING FABRIC**

- A. Protect from exposure to ultraviolet rays until placed.



- B. Reject rolls with broken or damaged cores, or factory wrinkled fabric that prevents wrinkle free placement.
- C. Place with binder of paving asphalt in accordance with Section 39-4.03 of Caltrans Standard Specifications.

### **3.04 ASPHALT CONCRETE SPREADING AND COMPACTING EQUIPMENT**

- A. Spreading Equipment: Caltrans Standard Specification Section 39-5.01.
- B. Compaction Equipment: Caltrans Standard Specification Section 39-5.02.

### **3.05 ASPHALT CONCRETE PLACEMENT**

- A. Place, spread and compact asphalt concrete to required grade, cross section, and thickness according to the Caltrans Standard Specification Sections 39-6.01, 39-6.02 and 39-6.03.
- B. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### **3.06 JOINTS**

- A. Construct joints to ensure continuous bond between adjoining paving sections according to the Caltrans Standard Specification Sections 39-6.01 and 39-6.02.
  - 1. Construct joints free of depressions with same texture and smoothness as other sections of asphalt course.
  - 2. Clean contact surfaces and apply tack coat.
  - 3. Offset longitudinal joints in successive courses a minimum of 6 inches.
  - 4. Offset transverse joints in successive courses a minimum of 24 inches.
  - 5. Compact joints as soon as asphalt concrete will bear roller weight without excessive displacement.

### **3.07 COMPACTION**

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact according to the Caltrans Standard Specification Sections 39-6.01 and 39-6.03.
- B. Compaction Requirements: Average Density to be 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- C. Finish Rolling: Finish roll paved surfaces to remove roller marks while asphalt is still warm.
- D. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.

- E. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh asphalt. Compact by rolling to specified density and surface smoothness.
- F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### **3.08 INSTALLATION TOLERANCES**

- A. Asphalt Pavement:
  - 1. Course thickness and surface smoothness within the tolerances specified in Caltrans Standard Specification Sections 39-6.01, 39-6.02 and 39-6.03.
  - 2. Total Thickness: Not less than indicated.
- B. Trench Patch:
  - 1. Compacted surface: Within 0.01 foot of adjacent pavement.
  - 2. Do not create ponding.
- C. Adjust Covers:
  - 1. Compacted surface: Up to 0.01 foot higher, and no lower, than adjacent pavement.
  - 2. Do not create ponding.

**END OF SECTION**

**SECTION 32 1600**  
**CURB, GUTTER AND SIDEWALKS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Materials for Portland cement concrete.
  - 2. Aggregate and aggregate grading for Portland cement concrete.
  - 3. Water for Portland cement concrete.
  - 4. Admixtures for Portland cement concrete.
  - 5. Proportioning for Portland cement concrete.
  - 6. Mixing and transporting Portland cement concrete.
  - 7. Formwork for cast in place Portland cement concrete.
  - 8. Embedded materials for Portland cement concrete.
  - 9. Steel reinforcement for Portland cement concrete.
  - 10. Placing and finishing Portland cement concrete.
  - 11. Curing Portland cement concrete.
  - 12. Protecting Portland cement concrete.
- B. Related Section include the following:
  - 1. Section 31 0000, Earthwork
  - 2. Section 32 1000, Base Courses

**1.02 RELATED DOCUMENTS**

- A. Geotechnical Design Recommendations – East Washington Park – Phase 2, Prepared by Miller Pacific Engineering Group, Dated January 10, 2020
- B. Geotechnical Investigation – East Washington Park, Prepared by Miller Pacific Engineering Group, Dated September 30, 2008.
- C. City of Petaluma Design and Construction Standards
- D. Petaluma standard specifications
- E. ASTM:
  - 1. A 82, Cold Drawn Steel Wire for Concrete Reinforcement.
  - 2. A 185, Steel Welded Wire Fabric, Plain for Concrete Reinforcement.
  - 3. A 615, Deformed and Plain Billet Steel Bars, for Concrete Reinforcement.
  - 4. C 94, Specification for Ready-mixed Concrete.
  - 5. C 114, Method for Chemical Analysis of Hydraulic Cement.
  - 6. C 150. Portland Cement.
  - 7. C 618, Fly Ash and Raw or Calcined Natural Pozzolan for use as Natural Admixture in Portland Cement.
  - 8. C 1751, Preformed Expansion Joint Fillers for Concrete. Paving and Structural Construction (Non-extruded and Resilient Bituminous Types).
- F. Caltrans Standard Specifications:
  - 1. Section 51: Concrete Structures.

2. Section 73: Concrete Curbs and Sidewalks.
3. Section 90: Portland Cement Concrete.

### 1.03 DEFINITIONS

- A. ASTM: American Society for Testing Materials

### 1.04 SUBMITTALS

- A. Submittal procedure shall be as outlined by the Engineer.
- B. Concrete Mix Design: Have all concrete mixes designed by a testing laboratory and approved by the Consulting Engineer. Conform all mixes to the applicable building code requirement, regardless of other minimum requirements listed herein or on the drawings. Submit mix designs for review before use. Show proportions and specific gravities of cement, fine and coarse aggregate, and water and gradation of combined aggregates.

### 1.05 QUALITY ASSURANCE

- A. Concrete shall be subject to quality assurance in accordance with Section 90 of Caltrans Standard Specifications.
1. Slump tests: Have available, at job site, equipment required to perform slump tests. Make one slump test for each cylinder sample, from same concrete batch. Allowable maximum slump shall be 4 inches for walls and 3 inches for slab on grade.
- B. Certifications:
1. Provide Engineer at the time of delivery with certificates of compliance signed by both Contractor and Supplier containing the following statements:
    - (a) Materials contained comply with the requirements of the Contract Documents in all respects.
    - (b) Proportions and mixing comply with the design mix approved by the Consulting Engineer. Design mix shall have been field tested in accordance with the herein requirements of the Caltrans Standard Specifications and produces the required compressive strength under like conditions.
    - (c) Statement of type and amount of any admixtures.
  2. Provide Engineer, at time of delivery, with certified delivery ticket stating volume of concrete delivered and time of mixing, or time of load-out in case of transit mixers.
  3. Conform to the applicable provisions of Section 51, 73 and 90 of the Caltrans Standard Specification and these Technical Specifications.
  4. Conform construction of portland cement concrete surface improvements (including curbs, gutters, medians, valley gutters, walks) to the requirements of Section 73 of the Caltrans Standard Specifications unless otherwise required in these Technical Specifications or shown on the Plans.
  5. Construct "V" ditches in accordance with Section 72-4 of the Caltrans Standard Specifications; except that finishing shall be in accordance with Caltrans Standard Specification Section 73 instead of 53, or as otherwise required in these Technical Specifications or shown on the Plans.
  6. Conform other construction of portland cement concrete items to the requirements of Section 51 of the Caltrans Standard Specifications unless otherwise required in these Technical Specifications or shown on the Plans.

## 1.06 DESIGNATION

- A. General: Whenever the 28-day compressive strength is designated herein or on the Plans is a 3,600psi or greater, the concrete shall considered to be designated by compressive strength. The 28-day compressive strength shown herein or on the plans which are less than a 3,600psi are shown for design information only and are not considered a requirement for acceptance of the concrete. Whenever the concrete is designated by class or as minor concrete herein or on the Plans, the concrete shall contain the cement per cubic yard shown in Section 90-1.01 of the Caltrans Standard Specifications.
- B. Unless specified otherwise herein or on the Plans, portland cement concrete for this Project shall be Class 2, not less than 590 pounds of portland cement/cubic yard of concrete, as specified in Section 90-1.01 of the Caltrans Standard Specifications.

## PART 2 PRODUCTS

### 2.01 PORTLAND CEMENT

- A. General: Type II (modified) cement conforming to section 90-2.01 of the Caltrans Standard Specifications.
- B. Provide a coloring equivalent to ¼ pound of lampblack per cubic yard in accordance with the plans and specifications of the County of Sonoma. Add to the concrete at the central mixing plant.

### 2.02 AGGREGATE AND AGGREGATE GRADING

- A. General: Conform to the requirements of Section 90-2.02, 2.02A and 2.02B of the Caltrans Standard Specifications.
- B. Aggregate Size and Gradation: Conform to the requirements of Section 90-3 of the Caltrans Standard Specifications for 1-inch maximum combined aggregate.

### 2.03 WATER

- A. General: Conform to the requirements of section 90-2.03 of the Caltrans Standard Specifications. For mixing and curing portland cement concrete and for washing aggregates.

### 2.04 EXPANSION JOINT MATERIAL

- A. Material for expansion joints in portland cement concrete improvements shall be premolded expansion joint fillers conforming to the requirements of ASTM Designation D 1751. Expansion joint material shall be shaped to fit the cross section of the concrete prior to being placed. Suppliers certificates showing conformance with this specification shall be delivered with each shipment of materials delivered to the job site. Unless noted otherwise herein or on the Plans expansion joint thickness shall be as follows:
  - 1. Curbs, Curb Ramps, Island Paving, Sidewalks, Driveways and Gutter Depressions: ¼-inch.
  - 2. Concrete Slope Protection, Gutter Lining, Ditch Lining and Channel Lining: ½-inch.
  - 3. Structures: As indicated.

## **2.05 REINFORCEMENT AND DOWELS**

- A. Bar reinforcement for concrete improvements shall be deformed steel bars of the size or sizes called for on the plans conforming to the requirements of ASTM Designation A 615 for Grade 60 bars. Size and shape for bar reinforcement shall conform to the details shown or called for on the Plans. Substitution of wire mesh reinforcement for reinforcing bars will not be allowed.
- B. Slip dowels, where noted or called for on the plans or detail drawings shall be smooth billet-steel bars as designated and conforming to the requirements of ASTM Designation A 615 for Grade 60 bars. Ends of bars inserted in new work shall be covered with a cardboard tube sealed with cork; no grease or oil shall be used.
- C. Mesh for reinforcement for concrete improvements shall be cold drawn steel wire mesh of the size and spacing called for on the plans conforming to the requirements of ASTM Designation A 82 for the material and ASTM Designation A 185 for the mesh. Size and extent of mesh reinforcement shall conform to the details shown or called for on the plans.
- D. Tie wire for reinforcement shall be eighteen (18) gauge or heavier, black, annealed conforming to the requirements of ASTM Designation A 82.
- E. Suppliers certificates showing conformance with this specification shall be delivered with each shipment of materials delivered to the job site.

## **2.06 ACCESSORY MATERIALS**

- A. Conform water stops and other items required to be embedded in of portland cement concrete structures to the applicable requirements of Section 51 of the Caltrans Standard Specifications unless otherwise specifically noted or called for on the Plans or detail drawings.

## **2.07 PRECAST CONCRETE STRUCTURES**

- A. Conform to the Standard Specifications of the County of Sonoma:

## **PART 3 EXECUTION**

### **3.01 STRUCTURAL EXCAVATION**

- A. Structural excavation may be either by hand, or by machine and shall be neat to the line and dimension shown or called for on the plans. Excavation shall be sufficient width to provide adequate space for working therein, and comply with CAL-OSHA requirements.
- B. Where an excavation has been constructed below the design grade, refill the excavation to the bottom of the excavation grade with approved material and compact in place to 95% of the maximum dry density.
- C. Remove surplus excavation material remaining upon completion of the work from the job site, or condition it to optimum moisture content and compact it as fill or backfill on the site, if the material is approved by the Geotechnical Consultant.

### 3.02 BRACING AND SHORING

- A. Conform to California and Federal OSHA requirements.
- B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the facility being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.
- C. Be solely responsible for all bracing and shoring and, if requested by the Engineer, submit details and calculations to the Engineer. The Engineer may forward the submittal to the Geotechnical Consultant, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations related to the proposed facility shall precede a response to the submittal by the Engineer.
- D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the position or operation of the facility being constructed or adjacent utilities and facilities.

### 3.03 PLACING CONCRETE FORMS

- A. Form concrete improvements with a smooth and true upper edge. Side of the form with a smooth finish shall be placed next to concrete. Construct forms rigid enough to withstand the pressure of the fresh concrete to be placed without any distortion.
- B. Thoroughly clean all forms prior to placement and coat forms with an approved form oil in sufficient quantity to prevent adherence of concrete prior to placing concrete.
- C. Carefully set forms to the alignment and grade established and conform to the required dimensions. Rigidly hold forms in place by stakes set at satisfactory intervals. Provide sufficient clamps, spreaders and braces to insure the rigidity of the forms.
- D. Provide forms for back and face of curbs, lip of gutters and edge of walks, valley gutters or other surface slabs that are equal to the full depth of the concrete as shown, noted or called for on the Plans. On curves and curb returns provide composite forms made from benders or thin planks of sufficient ply to ensure rigidity of the form.

### 3.04 PLACING STEEL REINFORCEMENT

- A. Bars shall be free of mortar, oil, dirt, excessive mill scale and scabby rust and other coatings of any character that would destroy or reduce the bond. All bending shall be done cold, to the shapes shown on the plans. The length of lapped splices shall be as follows:
  - 1. Reinforcing bars No. 8, or smaller, shall be lapped at least 45 bar diameters of the smaller bar joined, and reinforced bars Nos. 9, 10, and 11 shall be lapped at least 60 bar diameters of the smaller bars joined, except when otherwise shown on the plans.
  - 2. Splice locations shall be made as indicated on the plans.
- B. Accurately place reinforcement as shown on the plans and hold firmly and securely in position by wiring at intersections and splices, and by providing precast mortar blocks or ferrous metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist

crushing under applied loads. Provide supports and ties of such strength and density to permit walking on reinforcing without undue displacement.

- C. Place reinforcing to provide the following minimum concrete cover:
  - 1. Surfaces exposed to water: 4-inches.
  - 2. Surfaces poured against earth: 3-inches.
  - 3. Formed surfaces exposed to earth or weather: 2-inches.
  - 4. Slabs, walls, not exposed to weather or earth: 1-inch.
- D. Minimum spacing, center of parallel bars shall be two and one half (2-1/2) times the diameter of the larger sized bar. Accurately tie reinforcing securely in place prior to pouring concrete. Placing of dowels or other reinforcing in the wet concrete is not permitted.

### **3.05 MIXING AND TRANSPORTING PORTLAND CEMENT CONCRETE**

- A. Transit mix concrete in accordance with the requirements of ASTM Designation C 94. Transit mix for not less than ten (10) minutes total, not less than three (3) minutes of which shall be on the site just prior to pouring. Mix continuous with no interruptions from the time the truck is filled until the time it is emptied. Place concrete within one hour of the time water is first added unless authorized otherwise by the Engineer.
- B. Do not hand mix concrete for use in concrete structures

### **3.06 PLACING PORTLAND CEMENT CONCRETE**

- A. Thoroughly wet subgrade when concrete is placed directly on soil. Remove all standing water prior to placing concrete.
- B. Do not place concrete until the subgrade and the forms have been approved.
- C. Convey concrete from mixer to final location as rapidly as possible by methods that prevent separation of the ingredients. Deposit concrete as nearly as possible in final position to avoid re-handling.
- D. Place and solidify concrete in forms without segregation by means of mechanical vibration or by other means as approved by the Engineer. Continue vibration until the material is sufficiently consolidated and absent of all voids without causing segregation of material. The use of vibrators for extensive shifting of fresh concrete will not be permitted.
- E. Concrete in certain locations may be pumped into place upon prior approval by the Engineer. When this procedure requires redesign of the mix, such redesign shall be submitted for approval in the same manner as herein specified for approval of design mixes.

### **3.07 EXPANSION JOINTS**

- A. Construct expansion joints in accordance with City of Petaluma plans and Specifications.

### **3.08 WEAKENED PLANE JOINTS**



- A. Construct weakened plane joints in concrete curbs, gutters, sidewalks, median/island paving and valley gutters between expansion joints in accordance with County of Sonoma plans and Specifications.

**3.09 CONSTRUCTION**

- A. Form, place and finish concrete curbs, walkways, approaches in conformance with the applicable requirements of the City of Petaluma Standard specifications and plans.
- B. Construct new concrete curb, curb and gutter and valley gutters against existing asphalt concrete by removing a minimum of 12-inches of the asphalt concrete to allow placement of curb or gutter forms. Patch pavement with a 6-inch deep lift of asphalt concrete after gutter form is removed.

**3.010 CONNECTING TO EXISTING CONCRETE IMPROVEMENTS**

- A. New curb, gutter, or sidewalk is to connect to existing improvements to remain by saw cutting to existing sound concrete at the nearest score line, expansion joint or control joint. Drill and insert ½-inch diameter by 12-inch long dowels at 24-inches on center into existing improvements. Install pre-molded expansion joint filler at the matching joint.
- B. A cold joint to the existing curb is not acceptable.

**3.011 FIELD QUALITY CONTROL**

- A. Variation of concrete improvements from design grade and cross section as shown or called for on the plans shall not exceed the tolerances established in Sections 73-1.05 and/or 73-1.06 of the Caltrans Standard Specifications.

**3.012 RESTORATION OF EXISTING IMPROVEMENTS**

- A. Replace in kind all pavement or other improvements removed or damaged due to the installation of concrete improvements.
- B. Remove, landscaping or plantings damaged or disturbed due to the installation of concrete improvements. Replace in kind.

**END OF SECTION**

**SECTION 32 1726**  
**TACTILE WARNING SURFACES**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

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

**1.02 SECTION INCLUDES**

- A. Cast In Place Detectable/Tactile Warning Surface Tiles.
- B. Adhesive Detectable/Tactile Warning Surface

**1.03 RELATED SECTIONS**

- A. Section 32 1600, Curb, Gutter and Sidewalks
- B. Section 32 1216, Asphalt Paving

**1.04 SUBMITTALS**

- A. Follow submittal procedure outlined by the Engineer
- B. Product Data: Submit manufacturer's literature describing products, installation procedures and routine maintenance.
- C. Samples for Verification Purposes: Submit two tile samples minimum 6" x 6" for each kind indicated.
- D. Shop drawings are required for products specified showing fabrication details, composite structural system, tile surface profile, sound on cane contact amplification feature, plans of tile placement including joints, and material to be used as well as outlining installation materials and procedure.
- E. Material Test Reports: Submit complete test reports from qualified accredited independent testing laboratory's to qualify that materials proposed for use are in compliance with requirements and meet or exceed the properties indicated on the specifications. All tests shall be conducted on a Cast In Place Detectable/Tactile Warning Surface Tile system as certified by a qualified independent testing laboratory and be current within a 24 month period.
- F. Maintenance Instructions: Submit copies of manufacturer's specified installation and maintenance practices for each type of Detectable Warning Surface Tile and accessory as required.

**1.05 QUALITY ASSURANCE**

- A. Provide Detectable/Tactile Warning Surface Tiles and accessories as produced, engineered and field tested products by a single manufacturer with a minimum of three (3) years experience in the manufacturing of Cast in Place Detectable/Tactile Warning Surface Tiles.
- B. Installer's Qualifications: Engage an experienced Installer certified in writing by

Detectable/Tactile Warning Surface Tile manufacturer as qualified for installation, who has successfully completed installations similar in material, design, and extent to that indicated for Project.

- C. California Code of Regulations (CCR): Provide only approved DSAAC detectable warning products as provided in the California Code of Regulations (CCR) Title 24, Part 2, Section 205 definition of "Detectable Warning". Section 1117A.4 and 1127B.5 for "Curb Ramps" and Section 1133B.8.5 for "Detectable Warnings at Hazardous Vehicular Areas".
- D. Americans with Disabilities Act (ADA): Provide Detectable/Tactile Warning Surface Tiles which comply with the detectable warnings on walking surfaces section of the Americans with Disabilities Act (Title III Regulations, 28 CFR Part 36 ADA Standards For Accessible Design, Appendix A, Section 4.29.2 Detectable Warnings On Walking Surfaces).

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Detectable/Tactile Warning Surface Tiles shall be suitably packaged or crated to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy plastic wrappings to protect tile from concrete residue during installation and tile type shall be identified by part number.
- B. Detectable/Tactile Warning Surface Tiles shall be delivered to location at building site for storage prior to installation.

#### **1.07 SITE CONDITIONS**

- A. Environmental Conditions and Protection: Maintain minimum temperature of 40°F in spaces to receive Detectable/Tactile Warning Surface Tiles for at least 24 hours prior to installation, during installation, and for not less than 24 hours after installation.
- B. The use of water for work, cleaning or dust control, etc. shall be contained and controlled and shall not be allowed to come into contact with the general public. Provide barricades or screens to protect the general public.

#### **1.08 WARRANTY**

- A. Cast-In-Place Detectable/Tactile Warning Surface Tiles shall be guaranteed in writing for a period of five (5) years from date of final completion. The guarantee includes defective work, breakage, deformation, fading and loosening of tiles.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Basis-of-Design: The design based on VPC Cast-in-Place Detectable/Tactile Warning Surfaces manufactured by Engineered Plastics Inc. Williamsville, NY tel (800-682-2525), [www.armor-tile.com](http://www.armor-tile.com).

#### **2.02 CAST-IN-PLACE DETECTABLE WARNING TILES**

- A. Vitrified Polymer Composite (VPC) Cast in Place Detectable/Tactile Warning Surface Tiles shall be an epoxy polymer composition with an ultra violet stabilized coating employing aluminum oxide particles in the truncated domes. The tile shall incorporate an in-line pattern of truncated

domes measuring nominal 0.2" height, 0.9" base diameter, and 0.45" top diameter, spaced center-to-center 2.35" as measured on a diagonal and 1.67" as measured side by side. For wheelchair safety the field area shall consist of a non-slip surface with a minimum of 40 - 90° raised points 0.045" high, per square inch.

1. Dimensions: Cast In Place Detectable/Tactile Warning Surface Tiles shall be held within the following dimensions and tolerances:
2. Specifiers Note: Edit section below by selecting desired length and width. Delete non-relevant dimensions.
3. Length and Width: 24x48 nominal, unless otherwise indicated.
4. Depth: 1.375 (1-3/8") (+/-) 5% max.
5. Face Thickness: 0.1875 (1-3/8") (+/-) 5% max.
6. Warpage of Edge: 0.5% max.
7. Embedment Flange Spacing: shall be no greater than 3.1"
8. Color: Manufacturer's standard color, Charcoal Grey.
9. Water Absorption of Tile when tested by ASTM D 570-98 not to exceed 0.05%.
10. Slip Resistance of Tile when tested by ASTM C 1028-96 the combined Wet and Dry Static Co-Efficients of Friction not to be less than 0.80 on top of domes and field area.
11. Compressive Strength of Tile when tested by ASTM D 695-02a not to be less than 28,000 psi.
12. Tensile Strength of Tile when tested by ASTM D 638-03 not to be less than 19,000 psi.
13. Flexural Strength of Tile when tested by ASTM D 790-03 not to be less than 25,000 psi.
14. Chemical Stain Resistance of Tile when tested by ASTM D 543-95 (re approved 2001) to withstand without discoloration or staining - 10% hydrochloric acid, urine, saturated calcium chloride, black stamp pad ink, chewing gum, red aerosol paint, 10% ammonium hydroxide, 1% soap solution, turpentine, Urea 5%, diesel fuel and motor oil.
15. Abrasive Wear of Tile when tested by BYK - Gardner Tester ASTM D 2486-00 with reciprocating linear motion of  $37 \pm$  cycles per minute over a 10" travel. The abrasive medium, a 40 grit Norton Metallite sand paper, to be fixed and leveled to a holder. The combined mass of the sled, weight and wood block is to be 3.2 lb. Average wear depth shall not exceed 0.060 after 1000 abrasion cycles when measured on the top surface of the dome representing the average of three measurement locations per sample.
16. Resistance to Wear of Unglazed Ceramic Tile by Taber Abrasion per ASTM C501-84 (re approved 2002) shall not be less than 500.
17. Fire Resistance of Tile when tested to ASTM E 84-05 flame spread shall be less than 15.
18. Gardner Impact to Geometry "GE" of the standard when tested by ASTM D 5420-04 to have a mean failure energy expressed as a function of specimen thickness of not less than 550 in. lbf/in. A failure is noted when a crack is visible on either surface or when any brittle splitting is observed on the bottom plaque in the specimen.
19. Accelerated Weathering of Tile when tested by ASTM G 155-05a for 3000 hours shall exhibit the following result -  $\Delta E < 4.5$ , as well as no deterioration, fading or chalking of surface of tile color No 33538
20. Accelerated Aging and Freeze Thaw Test of Tile and Adhesive System when tested to ASTM D 1037-99 shall show no evidence of cracking, delamination, warpage, checking, blistering, color change, loosening of tiles or other detrimental defects.
21. Salt and Spray Performance of Tile when tested to ASTM B 117-03 not to show any deterioration or other defects after 200 hours of exposure.
22. AASHTO HB-17 single wheel HS20-44 loading "Standard Specifications for Highways and Bridges". The Cast In Place Tile shall be mounted on a concrete platform with a 1/2" airspace at the underside of the tile top plate then subjected to the specified maximum load of 10,400 lbs., corresponding to an 8000 lb individual wheel load and a 30% impact factor. The tile shall exhibit no visible damage at the maximum load of 10,400 lbs.
23. Embedment flange spacing shall be no greater than 3.1" center to center spacing.

## 2.03 ACCESSORIES

- A. Fasteners: Color matched, corrosion resistant, flat head drive anchor: 1/4-inch diameter x 1 1/2-inch long as supplied by.
- B. Sealant: Sealant as supplied by manufacture.

## PART 3 EXECUTION

### 3.01 EXAMINATION & PREPARATION

- A. During Cast in Place Detectable/Tactile Warning Surface Tile installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.
- B. Prior to placement of the Cast in Place Detectable/Tactile Warning Surface Tile system, review manufacturer and contract drawings with the Contractor prior to the construction and refer any and all discrepancies to the Engineer.

### 3.02 CAST-IN-PLACE INSTALLATION

- A. The installation of the structural embedment flange system and related materials shall be in strict accordance with the contract documents and the guidelines set by their respective manufacturers. Not recommended for asphalt applications.
- B. The physical characteristics of the concrete shall be consistent with the contract specifications while maintaining a slump range of 4 to 7 permitting solid placement of the Cast In Place Detectable/Tactile Warning Surface Tile system. An overly wet mix will cause the tile to float. Under these conditions, suitable weights such as 2 concrete blocks or sandbags (25 lb) shall be placed on each tile.
- C. The concrete pouring and finishing operations require typical mason's tools, however, a 4' long level with electronic slope readout, 25 lb. weights, and a large non-marring rubber mallet are specific to the installation of the Cast in Place Detectable/Tactile Warning Surface Tile system. A vibrating mechanism such as that manufactured by Vibco can be employed, if desired. The vibrating unit should be fixed to a soft base such as wood, at least 1 foot square.
- D. The factory-installed plastic sheeting must remain in place during the entire installation process to prevent the splashing of concrete onto the finished surface of the tile.
- E. When preparing to set the tile, it is important that no concrete be removed in the area to accept the tile. It is imperative that the installation technique eliminates any air voids under the tile. Holes in the tile perimeter allow air to escape during the installation process. Concrete will flow through the large holes in each embedment flange on the underside of the tile. This will lock the tile solidly into the cured concrete.
- F. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the tile placement. Immediately after finishing concrete, the electronic level should be used to check that the required slope is achieved. The tile shall be placed true and square to the curb edge in accordance with the contract drawings. The Cast In Place Detectable/Tactile Warning Surface Tiles shall be tamped (or vibrated) into the fresh concrete to ensure that the field level of the tile is flush to the adjacent concrete surface. The embedment process should not be accomplished by stepping on the tile as this may cause uneven setting which can result in air voids under the tile surface. The contract drawings indicate that the tile field level (base of

truncated dome) is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes.

- G. In cold weather climates it is recommended that the Cast In Place Detectable/Tactile Warning Surface Tiles be set deeper such that the top of domes are level to the adjacent concrete on the top and sides of ramp and that the base of domes to allow water drainage.
- H. Immediately after placement, the tile elevation is to be checked to adjacent concrete. The elevation and slope should be set consistent with contract drawings to permit water drainage to curb as the design dictates. Ensure that the field surface of the tile is flush with the surrounding concrete and back of curb so that no ponding is possible on the tile at the back side of curb.
- I. While concrete is workable, a 3/8-inch radius edging tool shall be used to create a finished edge of concrete, then a steel trowel shall be used to finish the concrete around the tile's perimeter, flush to the field level of the tile.
- J. During and after the tile installation and the concrete curing stage, it is imperative that there is no walking, leaning or external forces placed on the tile that may rock the tile causing a void between the underside of tile and concrete.
- K. Following tile placement, review installation tolerances to contract drawings and adjust tile before the concrete sets. Two suitable weights of 25 lb each may be required to be placed on each tile as necessary to ensure solid contact of the underside of tile to concrete.
- L. Following the concrete curing stage, protective plastic wrap is to be removed from the tile surface by cutting the plastic with a sharp knife, tight to the concrete/tile interface. If concrete bled under the plastic, a soft brass wire brush will clean the residue without damage to the tile surface.
- M. If desired, individual tiles can be bolted together using 1/4-inch or equivalent hardware. This can help to ensure that adjacent tiles are flush to each other during the installation process. Tape or caulking can be placed on the underside of the bolted butt joint to ensure that concrete does not rise up between the tiles during installation. Any protective plastic wrap which was peeled back to facilitate bolting or cutting, should be replaced and taped to ensure that the tile surface remains free of concrete during the installation process.
- N. Tiles can be cut to custom sizes, or to make a radius, using a continuous rim diamond blade in a circular saw or mini-grinder. Use of a straightedge to guide the cut is advisable where appropriate.
- O. Any sound-amplifying plates on the underside of the tile, which are dislodged during handling or cutting, should be replaced and secured with construction adhesive. The air gap created between these plates and the bottom of the tile is important in preserving the sound on cane audible properties of the tile system as required.

### **3.03 CLEANING, PROTECTING AND MAINTENANCE**

- A. Protect tiles against damage during construction period to comply with Tactile Tile manufacturer's specification.
- B. Protect tiles against damage from rolling loads following installation by covering with plywood or hardwood.
- C. Clean Tactile Tiles not more than four days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean Tactile Tile by method specified by Tactile Tile manufacturer.

- D. Comply with manufacturers maintenance manual for cleaning and maintaining tile surface and it is recommended to perform annual inspections for safety and tile integrity.

**END OF SECTION**

**SECTION 32 1813**

**SYNTHETIC TURF SYSTEM**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A. Furnish all labor, materials, tools and equipment necessary to install synthetic turf system as indicated on the Plans and as specified herein; including components and accessories required for a complete installation. including but not limited to
  - 1. Acceptance of prepared permeable base.
  - 2. Coordination with related trades to ensure a complete, integrated, and timely installation: permeable base (tested for permeability), grading and compacting, piping and drain components; as provided under its respective trade section.
  - 3. Synthetic turf for sports fields, infill material, shock/drain tile and geotextile fabric on prepared permeable base.
- B. Related Work:
  - 1. Section 03 3000 Cast-in-Place Concrete
  - 2. Section 32 1600 Curb, Gutter and Sidewalks

**1.02 REFERENCES**

- A. ASTM Standard Test Methods:
- B. D1577 - Standard Test Method for Linear Density of Textile Fiber
- C. D5848 - Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Covering
- D. D418 - Standard Test Method for Testing Pile Yarn Floor Covering Construction
- E. D1335 - Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings
- F. D1682 - Standard Method of Test for Breaking Load and Elongation of Textile Fabrics
- G. D5034 - Standard Test Method of Breaking Strength and Elongation of Textile Fabrics (Grab Test)
- H. F1015 - Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces
- I. D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity
- J. D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering
- K. F355 - Standard Test Method for Shock-Absorbing Properties of Playing Surfaces
- L. F1936 - Standard Test Method for Shock-Absorbing Properties of North American Football Field Playing Systems as Measured in the Field
- M. D1557 - Test Method for Laboratory Compaction Characteristics of Soil
- N. Technical Guidelines Brock PowerBase YSR Synthetic Base system for Synthetic Turf Fields for Materials, Installation, and Performance Guidelines for Synthetic (Drainage and Impact) Underlayment

**1.03 JOB CONDITIONS**

- A. Field subgrade preparation and permeable base shall be complete and approved by the Engineer prior to commencement of Work under this Section.

**1.04 QUALITY ASSURANCE**

- A. COMPANY EXPERIENCE



The synthetic turf contractor must be experienced in the manufacture and installation, in the United States, of synthetic infilled grass fields for at least 10 years of continuous operation.

They must also provide proof of the following:

1. Having installed at a minimum 500 fields of 65,000 square feet or more in the United States with the same manufacturer/company in the past 6 years utilizing the same turf system, sewn seams and micro-porous backing proposed for the specified field.
  2. Have at least fifty (50) synthetic grass fields in play for at least eight (8) years in the United States that have surpassed the manufacturer's warranty period.
  3. Have at least twenty five (25) fields installed in California and one hundred (100) fields in the U.S. of the turf system material, including a spined and/or ridged monofilament fiber, infill material, sewn seams and micro-porous backing that have been in play for a minimum of four years.
  4. Have ISO 9001, ISO 14001 and OHSAS 18011 certifications.
  5. Have a minimum of \$75,000,000 bonding capacity.
  6. Have an independent safety study for the specified synthetic turf system.
  7. Have a third party tuft bind certification confirming minimum requirement of 9 lbs tuft bind.
  8. Synthetic turf contractor must be the manufacturer of the synthetic turf system, not a reseller. Synthetic turf contractor must own manufacturing plant in the United States with exclusive control of its turf production, lead time and quality control.
  9. Have a sample written policy for the specified synthetic turf system for an 8-year minimum prepaid, non-prorated, third-party insured warranty and insurance policy for the proposed field(s).
  10. Have written stipulation that their synthetic turf system does not violate any other company/manufacturer's patents, patents allowed or patents pending.
  11. Have an audited company financial statement.
- B. The synthetic turf contractor and installer (if different) must provide competent personnel, skilled in the specified type of infilled synthetic turf system; they must have installed a minimum of 100 fields of 65,000 square feet or more with the specified manufacturer/company and synthetic turf system that is being proposed for this project. The designated supervisory personnel on the project must be certified in writing by the synthetic turf manufacturer as competent in the installation of this material, including sewing seams and proper installation of the infill mixture. The installation lead worker must have installed at least five (5) fields in the last two (2) years of the specified material. The synthetic turf manufacturer shall have a representative on site to certify the installation and warranty compliance.
- C. Prior to the award of bid, the synthetic turf contractor shall provide evidence that they meet the requirements of A - B above.
- D. Pre-Installation Conference: Conduct conference at project site at time to be determined by Engineer. Review methods and procedures related to installation including, but not limited to, the following:
1. Inspect and discuss existing conditions and preparatory work performed under other contracts.
  2. In addition to the Contractor and the installer, arrange for the attendance of installers affected by the Work, the Landscape Architect and the Engineer.
- E. Synthetic turf contractor shall verify special conditions required for the installation of the system.
- F. Synthetic turf contractor shall notify the Engineer of any discrepancies.

**1.05 SUBMITTALS**

- A. Substitutions: Other products are acceptable if in compliance with all requirements of these specifications. Submit alternate products to Engineer for approval prior to bidding.
  - 1. Provide substantiation that proposed system does not violate any other manufacturer's patents, patents allowed or patents pending.
  - 2. Provide a sample copy of insured, non-prorated warranty and insurance policy information.
- B. Shop Drawings:
  - 1. Indicate field layout; field marking plan and details for the specified sports; i.e. roll/seaming layout; methods of attachment, field openings and perimeter conditions.
  - 2. All designs, markings, layouts, and materials shall conform to all currently applicable National Collegiate Athletic Association rules and/or other standards that may apply to this type of synthetic turf installation, such as National Federation of High Schools rules and markings of American Legion Baseball guidelines.
  - 3. Show installation methods and construction indicating field verified conditions, clearances, measurements, terminations, drainage.
  - 4. Show size, color and location of Logo.
  - 5. Provide joint submission with related trades when requested by Engineer.
- C. Product Data:
  - 1. Submit manufacturer's catalog cuts, material safety data sheets (MSDS), brochures, specifications; preparation and installation instructions and recommendations; storage, handling requirements and recommendations.
  - 2. Submit fiber manufacturer's name, type of fiber and composition of fiber.
  - 3. Submit data in sufficient detail to indicate compliance with the contract documents.
  - 4. Submit manufacturer's instructions for installation.
  - 5. Submit manufacturer's instructions for maintenance for the proper care and preventative maintenance of the synthetic turf system, including painting and markings.
- D. Samples: Submit samples, 6 x 6 inches, illustrating details of finished product in amounts as required by General Requirements, or as requested by Engineer.
- E. Product Certification:
  - 1. Submit manufacturer's certification that products and materials comply with requirements of the specifications.
  - 2. Submit test results indicating compliance with Reference Standards.
- F. Project Record Documents: Record actual locations of seams, drains and other pertinent information in accordance with Division 1 Specifications Series, General Requirements.
- G. List of existing installations: Submit list including respective Owner's representative and telephone number.
- H. Warranties: Submit warranty and ensure that forms have been completed in Owner's name and registered with approved manufacturer.
- I. Testing data to the Owner to substantiate that the finished field meets the required shock attenuation, as per ASTM F1936.
- J. Testing Certification: Submit certified copies of independent (third-party) laboratory reports on ASTM testing:
  - 1. Pile Height, Face Weight & Total Fabric Weight, ASTM D5848.
  - 2. Primary & Secondary Backing Weights, ASTM D5848.
  - 3. Tuft Bind, ASTM D1335.
  - 4. Grab Tear Strength, ASTM D1682 or D5034.

5. Shock Attenuation, ASTM F1936.
6. Water Permeability, ASTM D4491
7. Additional testing as listed in Technical Guidelines Brock PowerBase YSR Synthetic Base Systems for Synthetic Turf Fields

**1.06 DELIVERY, STORAGE AND HANDLING**

- A. Prevent contact with materials that may cause dysfunction.
- B. Deliver and store components with labels intact and legible.
- C. Store materials/components in a safe place, under cover, and elevated above grade.
- D. Protect from damage during delivery, storage, handling and installation. Protect from damage by other trades.
- E. Inspect all delivered materials and products to ensure they are undamaged and in good condition.
- F. Comply with Manufacturer's recommendations.

**1.07 SEQUENCING AND SCHEDULING**

- A. Coordinate the Work with installation of work of related trades as the Work proceeds.
- B. Sequence the Work in order to prevent deterioration of installed system.

**1.08 WARRANTY**

- A. The synthetic turf contractor shall provide a warranty to the City that covers defects in materials and workmanship of the turf for a period of eight (8) years from the date of substantial completion. The synthetic turf manufacturer must verify that their representative has inspected the installation and that the work conforms to the manufacturer's requirements. The manufacturer's warranty shall include general wear and damage caused from UV degradation. The synthetic turf contractor shall provide a warranty to the City that covers defects in the installation workmanship, and further warrant that the installation was done in accordance with both the synthetic turf manufacturer's recommendations and any written directives of the manufacturer's representative. Prior to final payment, the synthetic turf contractor shall submit notification in writing to the City that the field is officially added to the annual policy coverage, guaranteeing the warranty to the City. The insurance policy must be underwritten by an "AM Best" A rated carrier.
- B. The warranty shall have the following characteristics:
  1. Pre-Paid 8-year insured warranty.
  2. Insured Warranty coverage must be provided in the form of one (1) single policy.
  3. Maximum per claim coverage amount of \$32,000,000.
  4. Minimum of \$32,000,000 annual aggregate.
  5. Must cover full 100% replacement value of total square footage installed, minimum of \$10.00 per sq. ft. (in case of complete product failure, which will include removal and disposal of the existing surface)
  6. Policies that include self-insurance or self-retention clauses shall not be considered.
  7. Policy cannot include any form of deductible amount.
- C. The synthetic grass system must maintain a G-max of less than 170 for the life of the Warranty as per ASTM F1936.

**1.09 MAINTENANCE SERVICE**

- A. Synthetic turf contractor shall train the City's facility maintenance staff in the use of the turf maintenance equipment.
- B. Synthetic turf contractor shall provide maintenance guidelines to the Engineer.
- C. The synthetic turf contractor shall provide 4 maintenance service visits at the City's request during the 8 year warranty period.
  - 1. Each maintenance service visit shall be include 1 SMG Sportchamp, or acceptable equivalent, grooming session including:
    - a. A general sweeping to remove foreign objects such as dirt, leaves, bird droppings, gum and other debris that may collect on the field surface.
    - b. A deep groom, sweep and rejuvenation to de-compact infill and to maintain appropriate G-max levels.
    - c. Overall analysis and inspection of the synthetic turf and its applicable systems, including fiber wear analysis, ultraviolet degradation, infill depth and consistency, infill migration, field edging attachments, sewn and glued seams, line verification and field inlays.
    - d. Repairs including sewing, adhesive failures, inlay separation and general workmanship.

**PART 2 MATERIALS**

**2.01 GEOTEXTILE FABRIC**

- A. Geotextile fabric shall be reviewed and approved by the Geotechnical Engineer and Civil Engineer.

**2.02 SHOCK/DRAIN TILE**

- A. Shock/drain tile shall be reviewed and approved by the Geotechnical Engineer and Civil Engineer.

**2.03 SYNTHETIC TURF**

- A. Synthetic turf shall be FieldTurf 2" Vertex Prime Purefill (outfield grass and apron), FieldTurf 2" Vertex Prime PureSelect (infield grass and bullpen), and FieldTurf 1.6" Vintage-40 PureSelect (infield and warning track), or approved equal. Available through Andrew Rowley, Phone (707) 586-8873.
- B. Synthetic turf materials shall consist of the following:
  - 1. Carpet made of monofilament polyethylene fibers tufted into a fibrous, non-perforated, porous backing.
  - 2. Infill: Controlled mixture of silica sand and granulated cork that partially covers the carpet. Provide and install manufacturer approved infill topdressing at warning tracks to provide tactile and audible variation from the adjacent field surface.
  - 3. Glue, thread, paint, seaming fabric and other materials used to install and mark the synthetic turf field.

C. The installed synthetic turf system shall have the following properties:

Standard	Property	Specification
ASTM D1577	Fiber Denier	10,800
ASTM D3218	Tape Thickness	235 Microns
ASTM D5823	Pile Height	2"
ASTM D5793	Stitch Gauge	3/4"
ASTM D5848	Pile Weight	34oz/square yard
ASTM D5848	Primary Backing	7+oz/square yard
ASTM D5848	Secondary Backing	14+oz/square yard
ASTM D5848	Total Weight	55oz/square yard
ASTM D1335	Tuft Bind (Without Infill)	8+ lbs.
ASTM D5034	Grab Tear (Width)	200 lbs./force
ASTM D5034	Grab Tear (Length)	200 lbs./force
ASTM D4491	Carpet Permeability	>40 inches/hour
ASTM F355/F1936	Impact Attenuation (Gmax)	<200
	i. Granulated Cork 1-2 Component	0.75lbs/square foot
	ii. Silica Sand Infill Component	4.5lbs/square foot
	iii. Total Product Weight	811oz/square yard
	iv. Shock/Drain Tile	Brock PowerBase YSR

D. Carpet shall consist of monofilament fibers tufted into a primary backing with a secondary backing.

E. Carpet Rolls shall be 15' wide rolls.

1. Rolls shall be long enough to go from edge to edge of field.

F. Backing:

1. Primary backing shall be a double-layered polypropylene fabric treated with UV inhibitors.

2. Secondary backing shall consist of an application of porous, heat-activated urethane to permanently lock the fiber tufts in place.

3. Perforated (with punched holes), backed carpet are unacceptable.

G. Fiber shall be 10,800 denier, low friction, and UV-resistant fiber measuring not less than 2 inches high.

1. Systems with fiber height less than listed are unacceptable.

H. Infill materials shall be approved by the manufacturer.

1. Infill shall consist of a resilient layered granular system, comprising selected and graded silica sand and granulated cork.

2. Synthetic Turf products without silica sand and granulated cork as its sole infill components will not be acceptable.

3. The silica sand component of the infill must represent a minimum of 51% or more of the total infill, by weight.

4. Granulated cork must have a bulk density of 0.19 g/cm<sup>3</sup> +/- 15%.

5. Granulated cork must be a 1-2mm particle.

I. Non-tufted or inlaid lines and markings shall be painted with paint approved by the synthetic turf manufacturer.

J. Thread for sewing seams of turf shall be as recommended by the synthetic turf manufacturer.

- K. Glue and seaming fabric for inlaying lines and markings shall be as recommended by the synthetic turf manufacturer.

#### **2.04 SYNTHETIC TURF MAINTENANCE EQUIPMENT**

- A. The synthetic turf contractor shall supply a field sweeper and groomer, which shall include a towing mechanism compatible with a field utility vehicle.
- B. Field sweeper shall be a FieldTurf SweepRight, or approved equal.
- C. Field groomer shall be a FieldTurf GroomRight, or approved equal.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that all sub-base, drainage and leveling is complete prior to installation.
- B. Finish surface planarity of permeable base shall be verified by the synthetic turf contractor. A mason's line, held taught between two (2) workmen separated by a distance of approximately 40 feet, shall be placed directly on the finished surface, parallel to the direction of greatest slope. A third workman shall check for separations between the mason's line and the finished surface that are equal to or greater than the specified tolerances. Areas of separation shall be outlined with marking paint and the depth of separation indicated.
- C. The synthetic turf contractor shall accept the permeable base planarity, compaction and permeability prior to the installation of materials within their scope of work.
- D. Beginning of installation by the synthetic turf contractor means acceptance of existing conditions.

#### **3.02 INSTALLATION - GENERAL**

- A. The installation shall be performed in full compliance with approved Shop Drawings.
- B. Only trained technicians, skilled in the installation of athletic caliber synthetic turf systems working under the direct supervision of the approved installer supervisors, shall undertake any cutting, sewing, gluing, shearing, top-dressing or brushing operations.
- C. The designated Supervisory personnel on the project must be certified, in writing by the turf manufacturer, as competent in the installation of this material, including sewing seams and proper installation of the Infill mixture.
- D. Designs, markings, layouts, and materials shall conform to all currently applicable National Collegiate Athletic Association rules, NFHS rules, and/or other rules or standards that may apply to this type of synthetic turf installation. Designs, markings and layouts shall first be approved by the Engineer in the form of final shop drawings. All markings will be in full compliance with final shop drawings.

#### **3.03 INSTALLATION**

- A. The synthetic turf contractor shall strictly adhere to the installation procedures outlined under this section. Any variance from these requirements must be accepted in writing, by the synthetic turf manufacturer's onsite representative, and submitted to the Engineer, verifying that the changes do not in any way affect the warranty.

- B. The synthetic turf contractor shall install geotextile fabric, shock/drain tile and carpet rolls directly over the properly prepared permeable base. Extreme care should be taken to avoid disturbing the permeable base, both in regard to compaction and planarity.
- C. Full width rolls shall be laid out across the field and other areas.
  - 1. Turf shall be of sufficient length to permit full cross-field installation from edge to edge.
  - 2. No cross seams will be allowed in the main playing area between the sidelines.
  - 3. Each roll shall be attached to the next roll utilizing standard state-of-the-art sewing procedures.
  - 4. When all of the rolls of the playing surface have been installed, the sideline areas shall be installed at right angles to the playing surface.
- D. Synthetic turf panel seams shall be sewn along the selvedge edging flap of the turf roll. Seams secured by other means including gluing are unacceptable. Installation shall be 99% sewn.
  - 1. Minimum gluing will only be permitted to repair problem areas, corner completions, and to cut in any logos or inlaid lines as required by the specifications.
  - 2. Seams shall be flat, tight, and permanent with no separation or fraying.
  - 3. In the case of all lines and logos, turf carpet must be field fibers must be sheared to the backing (do not cut the backing) and adhered using hot melt adhesives.
- E. Infill Materials:
  - 1. Infill materials shall be applied in numerous thin lifts. The turf shall be brushed as the mixture is applied. The infill material shall be installed to a depth determined by the manufacturer.
  - 2. Two-layered infill shall be installed in a systematic order.
  - 3. Infill materials shall be installed to fill the voids between the fibers and allow the fibers to remain vertical and non-directional. The Infill installation consists of a base layer of silica sand followed by a layer of granulated cork. Infill density shall consist of no more than 4.5 pounds of silica sand, 0.75 pounds of 1-2 granulated cork.
- F. Synthetic turf shall be attached to the perimeter edge detail in accordance with the manufacturer's standard procedures.
- G. Upon completion of installation, the finished field shall be inspected by the installation crew and an installation supervisor.
- H. The synthetic turf contractor shall provide the necessary testing data to the Engineer that verifies the finished field meets or exceeds the required shock attenuation. The G-max range shall be between 100 and 170 for the life of the warranty, as determined by ASTM F355A and F1936 test procedures.
- I. At the near substantial completion of the synthetic turf fields, the synthetic turf contractor shall pay for field to be tested for shock absorbency by an independent testing laboratory accredited for such tests, and shall be pre-approved by the Engineer. All testing and analysis of findings shall be completed by qualified persons utilizing correct techniques. Any tests results that do not meet the requirements of this specification or if any one test value is greater than ten percent (10%) greater in variance as specified, then the synthetic turf contractor shall address the failed test area, be required to retest the entire field and conform to these requirements prior to the issuance of the Certificate of Substantial Completion.
- J. Synthetic turf manufacturer shall be responsible for the testing of the G-max levels of the installed synthetic turf at years two, four, six and one month prior to the completion of year eight. If any of these tests do not fall within the G-max range as specified in this specification section, the synthetic turf manufacturer will be required to modify the field

composition to the sole satisfaction of the Engineer so that it falls within the target G-max range. All costs associated with such work shall be borne solely by the synthetic turf manufacturer. Any failed test shall be retested to verify that the field meets the specifications. All testing shall be paid by the synthetic turf manufacturer. All testing shall be completed by an independent testing laboratory accredited for such tests, and shall be pre-approved by the Engineer. All testing and analysis of findings shall be completed by qualified persons utilizing the required techniques outlined in the ASTM F355 test standard.

**3.04 FIELD MARKINGS**

- A. Field markings shall be installed in accordance with the Plans and approved Shop Drawings.

**3.05 CLEANUP AND PROTECTION**

- A. Contractor shall protect installed synthetic turf system from subsequent construction operations.
- B. Contractor shall not permit traffic over unprotected surfaces.
- C. Contractor shall provide the labor, supplies, and equipment as necessary for final cleaning of surfaces and installed items.
- D. All usable remnants of new material shall become the property of the City.
- E. Contractor shall keep the area clean throughout the project and clear of debris.
- F. Surfaces, recesses, enclosures, etc., shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the City.

**END OF SECTION**



## SECTION 32 1814

### SYNTHETIC LANDSCAPE TURF SYSTEM

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Furnish all labor, materials, tools and equipment necessary to install synthetic landscape turf system as indicated on the Plans and as specified herein; including components and accessories required for a complete installation. including but not limited to
  - 1. Acceptance of prepared aggregate base.
  - 2. Coordination with related trades to ensure a complete, integrated, and timely installation: permeable base (tested for permeability), grading and compacting, piping and drain components; as provided under its respective trade section.
  - 3. Synthetic landscape turf (non-sports field applications only) and infill material on prepared aggregate base.
- B. Related Work:
  - 1. Section 03 3000 Cast-in-Place Concrete
  - 2. Section 32 1600 Curb, Gutter and Sidewalks

##### 1.02 REFERENCE STANDARDS

- A. For accessibility, ground surfaces shall comply with ASTM F 1951
- B. ASTM Standard Test Methods:
  - D1577 - Standard Test Method for Linear Density of Textile Fiber
  - D5848 - Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Covering
  - D1338 - Standard Test Method for Tuft Bind of Pile Yarn Floor Covering.
  - D1682 - Standard Method of Test for Breaking Load and Elongation of Textile Fabrics.
  - D5034 - Standard Test Method of Breaking Strength and Elongation of Textile Fabrics (Grab Test).
  - D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  - D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.

##### 1.03 PERFORMANCE REQUIREMENTS

- A. Completed synthetic landscape turf system shall be capable of meeting the following performance requirements:
  - 1. ASTM D4491: Water permeability test. Synthetic landscape turf shall drain at a rate of 250 inches or more, of water per hour.
  - 2. ASTM D1338: Tuft bind. Synthetic landscape turf shall have a tuft bind, without infill material of 9 pounds or more.

##### 1.04 SUBMITTALS

- A. Substitutions: Other products are acceptable if in compliance with all requirements of these specifications. Submit alternate products to the Engineer for approval prior to bidding.
  - 1. Provide substantiation that proposed system does not violate any other manufacturer's patents, patents allowed or patents pending.
  - 2. Provide a sample copy of insured, non-prorated warranty and insurance policy information.
- B. Product Data:

1. Submit manufacturer's catalog cuts, material safety data sheets (MSDS), brochures, specifications; preparation and installation instructions and recommendations.
  2. Submit fiber manufacturer's name, type of fiber and composition of fiber.
  3. Submit data in sufficient detail to indicate compliance with the contract documents.
  4. Submit manufacturer's instructions for installation.
- C. Samples: Submit samples, illustrating details of finished product in amounts as required by General Requirements, or as requested by the Engineer.
- D. List of existing installations: Submit list including respective Owner's representative and telephone number.
- E. Warranties: Submit warranty and ensure that forms have been completed in Owner's name and registered with approved manufacturer.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Engaged in manufacturing synthetic landscape turf surfacing products for a minimum of fifteen (15) years.
1. The Manufacturer shall be experienced in the manufacturing and installation of specified type of synthetic landscape turf surfacing system. This includes use of a ridged monofilament fiber, a texturized monofilament fiber, backing, the backing coating, and the installation method.
  2. The Manufacturer shall own and operate its own manufacturing plant. Manufacturing the fiber, tufting of the fibers into the backing materials and coating of the synthetic landscape turf system must be done in-house by manufacturer.
  3. The Manufacturer must hold ISO 9001, ISO 14001 and OHSAS 18001 certifications demonstrating its manufacturing efficiency with regards to quality, environment and safety management systems.
- B. Installer/Contractor Qualifications: Company shall specialize in performing the work of this section.
1. The Company shall provide competent workmen skilled in this specified type of synthetic landscape turf system installation.
  2. The designated Supervisory Personnel on the project shall be certified, in writing by the manufacturer, as competent in the installation of specified type of synthetic landscape turf system, including gluing seams and proper installation of the infill material.
  3. The Company shall be certified by the manufacturer and licensed (if required).
- C. Pre-Installation Conference: Conduct conference at project site at time to be determined by the Engineer. Review methods and procedures related to installation including, but not limited to, the following:
1. Inspect and discuss existing conditions and preparatory work performed under other contracts.
  2. In addition to the Contractor and the installer, arrange for the attendance of installers affected by the Work, Engineer, and the Landscape Architect.
- D. The Installer/Contractor shall verify special conditions required for the installation of the synthetic landscape turf system if required.
- E. The Installer/Contractor shall notify the Engineer of any discrepancies.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Deliver and store components with labels intact and legible.
- B. Store materials/components in a safe place, under cover, and elevated above grade.

- C. Protect from damage during delivery, storage, handling and installation. Protect from damage by other trades.
- D. Inspect all delivered materials and products to ensure they are undamaged and in good condition.

**1.07 SEQUENCING AND SCHEDULING**

- A. Coordinate the Work with installation of work of related trades as the Work proceeds.
- B. Sequence the Work in order to prevent deterioration of installed system.

**1.08 WARRANTY**

- A. The Installer/Contractor shall provide a warranty to the City that covers defects in materials and workmanship of the synthetic landscape turf product for a period of eight (8) years from the date of substantial completion. The synthetic landscape turf manufacturer must verify that their representative has inspected the installation and that the work conforms to the manufacturer's requirements. The manufacturer's warranty shall include general wear and damage caused from UV degradation. The warranty shall specifically exclude vandalism, and acts of God beyond the control of the City or the manufacturer. The warranty shall be fully third party insured; pre-paid for the entire 8 year term and be non-prorated. The Installer/Contractor shall provide a warranty to the City that covers defects in the installation workmanship, and further warrant that the installation was done in accordance with both the manufacturer's recommendations and any written directives of the manufacturer's representative. The insurance policy must be underwritten by an "AM Best" A rated carrier and must reflect the following values:
- B. The warranty shall have the following characteristics:
  - 1. Pre-Paid 8-year insured warranty.
  - 2. Maximum per claim coverage amount of thirty-two million dollar (\$32,000,000).
  - 3. Minimum of thirty-two million dollar (\$32,000,000) annual aggregate.
  - 4. Must cover full 100% replacement value of total square footage installed.
  - 5. Policies that include self-insurance or self-retention clauses shall not be considered.
  - 6. Policy cannot include any form of deductible amount.
  - 7. Sample policy must be provided at time of bid to prove that policy is in force. A letter from an agent or a sample Certificate of Insurance will not be acceptable.

**PART 2 MATERIALS AND PRODUCTS**

**2.01 SYNTHETIC LANDSCAPE TURF SYSTEM**

- A. Synthetic landscape turf shall be FieldTurf Nutmeg Premium with rounded silica granule infill, or approved equal
- B. Synthetic landscape turf materials shall consist of the following:
  - 1. Synthetic landscape turf made of a combination of ridged monofilament polyethylene fibers and texturized monofilament fibers, tufted into a fibrous, non-perforated, porous backing.
  - 2. Infill: Graded dust-free silica sand that partially covers the synthetic landscape turf.
  - 3. Glue, thread, seaming fabric and other materials used to install and mark the synthetic landscape turf.
- C. Synthetic landscape turf product shall consist of soft spined monofilament fibers and texturized monofilament fibers tufted into a primary backing with a secondary backing.
- D. Backing:
  - 1. Primary backing shall be a double-layered polypropylene fabric treated with UV inhibitors.

2. Secondary backing shall consist of an application of porous urethane to permanently lock the fiber tufts in place.
  3. Perforated (with punched holes), backed carpet are unacceptable.
  4. Turf with attached scrim in lieu of porous urethane is unacceptable.
- E. Primary fiber shall be 10,800 denier, low friction, and UV-resistant fiber measuring not less than 1.625 inches high. Secondary fiber shall be 5,600 denier.
- F. Infill materials shall be approved by the manufacturer.
1. Infill shall consist of graded dust-free silica sand.
  2. Glue and seaming fabric, for seaming of synthetic landscape turf shall be as recommended by the synthetic landscape turf manufacturer.

## **2.02 QUALITY CONTROL IN MANUFACTURING**

- A. The manufacturer shall own and operate its own manufacturing plant in North America. Both tufting of the fibers into the backing materials and coating of the turf system must be done in-house by the synthetic landscape turf manufacturer. Outsourcing of either is unacceptable.
- B. The manufacturer shall have full-time certified in-house inspectors at their manufacturing plant that are experts with industry standards.
- C. The manufacturer's full-time in-house certified inspectors shall perform pre-tufting fiber testing on tensile strength, elongation, tenacity, and denier, upon receipt of fiber spools from fiber manufacturer.
- D. Primary backing shall be inspected by the manufacturer's full-time certified in-house inspectors before tufting begins.
- E. The manufacturer's full-time in-house certified inspectors shall verify "pick count", yarn density in relation to the backing, to ensure the accurate amount of face yarn per square inch.
- F. The manufacturer's full-time, in-house, certified inspectors shall perform product inspections at all levels of production including during the tufting process and at the final stages before the synthetic landscape turf is loaded onto the truck for delivery.
- G. The manufacturer shall have its own, in-house laboratory where samples of synthetic landscape turf are retained and analyzed, based on standard industry tests, performed by full-time, in-house, certified inspectors.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that all sub-base leveling is complete prior to installation.
- B. Finish surface planarity of permeable base shall be verified by the synthetic landscape turf contractor. A mason's line, held taught between two (2) workmen shall be placed directly on the finished surface, parallel to the direction of greatest slope. A third workman shall check for separations between the mason's line and the finished surface that are equal to or greater than the specified tolerances. Areas of separation shall be outlined with marking paint and the depth of separation indicated.
- C. The synthetic landscape turf contractor shall accept the permeable base planarity, compaction and permeability prior to the installation of materials within their scope of work.
- D. Do not proceed until unsatisfactory conditions are corrected.

- E. Beginning of installation by the synthetic landscape turf contractor means acceptance of existing conditions.

### 3.02 PREPARATION

- A. Prior to the beginning of installation, inspect the sub-base for tolerance to grade.
- B. Sub-base acceptance shall be subject to receipt of test results (by others) for compaction and planarity that sub-base is in compliance with project specifications.

### 3.03 INSTALLATION

- A. The installation shall be performed in full compliance with approved Shop Drawings.
- B. Only trained technicians, skilled in the installation of synthetic landscape turf systems working under the direct supervision of the approved installer supervisors, shall undertake any cutting, sewing, gluing, shearing, top-dressing or brushing operations.
- C. The designated Supervisory personnel on the project must be certified, in writing by the manufacturer, as competent in the installation of this material, including gluing seams and proper installation of the Infill material.
- D. Install at location(s) indicated, to comply with final shop drawings, manufacturers' / installer's instructions.
- E. The Installer/Contractor shall strictly adhere to specified procedures. Any variance from these requirements shall be provided in writing, by the manufacturer's on-site representative, and submitted to the Engineer verifying that the changes do not in any way affect the Warranty. Infill materials shall be approved by the manufacturer and installed in accordance with the manufacturer's standard procedures.
- F. Synthetic landscape turf system shall be installed directly over the properly prepared aggregate base. Extreme care shall be taken to avoid disturbing the aggregate base, both in regard to compaction and planarity.
  - 1. Repair and properly compact any disturbed areas of the aggregate base as recommended by manufacturer.
  - 2. Seams shall be flat, tight, and permanent with no separation or fraying.
- G. Infill Materials:
  - 1. Infill materials shall be applied in thin lifts. The turf shall be brushed as the material is applied. The infill material shall be installed to a depth determined by the manufacturer.
  - 2. Infill material shall be installed in a systematic order.
  - 3. Infill materials shall be installed to fill the voids between the fibers and allow the fibers to remain vertical and non-directional. The Infill installation consists of graded dust-free silica sand. Graded dust-free acrylic coated silica sand may be substituted for silica sand as requested by the Engineer.
  - 4. Infill density shall consist of 2.75 pounds of graded silica sand, per square foot. Top of infill elevation shall be not be higher than adjacent surfaces and not more than one quarter inch (1/4") below finish grade of adjacent walking surfaces.
  - 5. The Installer/Contractor shall keep area clean throughout the project and clear of debris. Upon completion of installation, the finished project shall be inspected by the installation crew and an installation supervisor.

**3.04 CLEANUP AND PROTECTION**

- A. Contractor shall protect installed synthetic landscape turf system from subsequent construction operations.
- B. Contractor shall not permit traffic over unprotected surfaces.
- C. Contractor shall provide the labor, supplies, and equipment as necessary for final cleaning of surfaces and installed items.
- D. Contractor shall keep the area clean throughout the project and clear of debris.
- E. Surfaces, recesses, enclosures, etc., shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the City.

**END OF SECTION**

**SECTION 32 3113**

**CHAIN LINK FENCES AND GATES**

**PART 1 GENERAL**

**1.01 SUMMARY**

A. Scope of Work

The Contractor shall furnish all labor, materials, equipment, and incidentals necessary to furnish and construct the fencing specified herein, and shown on the Drawings, complete.

B. The work shall include, but shall not be limited to:

1. Fence and Gate Fabric, Rails, Hardware, Framework, and Posts
2. Windscreen
3. Excavation for Post Bases
4. Concrete Anchorage for Posts
5. Windscreen

C. Related Work

6. 03 3000 Cast-In-Place Concrete
7. 32 1313 Concrete Paving

**1.02 COORDINATION**

- A. Coordinate work fully with all other trades involved. Coordinate with items of other trades to be furnished and set in place. Such portions of their work as is all or in part embedded, built-in, attached to, or supported by the work shall be executed by them in ample time that progress of the work is not delayed. Contractor shall be responsible for the proper installation of all items related to this section.

**1.03 REFERENCE**

- A. Perform work in accordance with all applicable laws, codes and regulations, as required by the Engineer.
- B. Reference to "Standard Specifications" shall mean the current Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS.

**1.04 SUBMITTALS**

The following information shall be submitted for approval by the Engineer.

- A. Erector Qualifications:
- B. List of seven (7) similar fence installations in Northern California. Include job location and name and phone number of project administrator.
- C. Product Data: Submit Manufacturer's descriptive literature and/or standard catalog "cut-sheets" of all materials, coatings, fittings and equipment proposed to be furnished and installed under this portion of the work. Include Manufacturer's name and catalog number

for each item where applicable. Clearly annotate (star or asterisk – in black ink) which portions of “cut-sheets” are applicable if more than one product is shown.

1. Framework (rail, post and gate)
  2. Wire mesh
  3. Support arm
  4. Hinges and latches
  5. Gate hardware
  6. Windscreen
- D. Shop Drawings: Submit complete Shop Drawings for all different types and sizes of gates and fencing systems.
1. Shop Drawings shall include, but not be limited to:
    - a. All information regarding clearances, connections, components and any miscellaneous related appurtenances (such as locking mechanisms, wiring etc.).
    - b. Concrete footing and reinforcement information.
- E. Installation instructions and/or drawings: Submit as applicable.

#### **1.05 SEQUENCE AND SCHEDULING**

- A. Contractor shall coordinate construction timing of all fencing and related work with installation of concrete work and all other work.

#### **1.06 CLEAN UP**

- A. Keep job site free of debris and rubbish as well as excess materials, tools and equipment connected with work specified herein. Clean up periodically during construction and at completion of work specified herein; lawfully dispose of all such material off City’s premises.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. General Note: It is intended that all fencing, by area, receive the same finish coating wherever possible. Nuts, bolts, applicable moving portions of hinges etc, shall be finished to match.
- B. Fabric
1. Selvage: Knuckled finish top and bottom.
  2. Steel Fabric: Comply with Chain Link Fence Manufacturers Institute (CLFMI) Product Manual. Furnish one-piece fabric widths for fencing up to sixteen feet (16’) feet high. Wire sizes includes zinc coating.
  3. Size: Two inch (2”) mesh, 9-gauge (0.148 inch diameter), or as noted on the Drawings.
  4. Galvanized Wire: Zinc coated wire-ASTM A 392, Class 1, with not less than 1.2 oz. zinc per sq. ft.
  5. Thermally fused and bonded PVC (vinyl coated) Finish: ASTM F 668 Class 2b, 7mil (0.18 mm) thickness thermally fused over zinc coated wire.
- C. Framing
1. Strength requirements for posts and rails shall conform to ASTM F 669.
  2. Pipe shall be straight, true to section, material, and sizes specified, and shall conform to the following weights per foot:



<u>NPS in Inches</u>	<u>Outside Diameter (OD in inches)</u>	<u>Type 1 Steel</u>	<u>Type 2 Steel</u>
1	1.315	1.68	1.35
1.25	1.660 (1-5/8")	2.27	1.84
1.5	1.900 (2")	2.72	2.28
2	2.375 (2-1/2")	3.65	3.12
2.5	2.875 (3")	5.79	4.64
3	3.500	7.58	5.71
3.5	4.000	9.11	6.56
4	4.500	10.79	---
6	6.625	18.97	---
8	8.625	28.55	---

D. Steel Framework

1. Posts, Rails, Braces, and Gate Frames:
  - a. Type I Steel Pipe: Hot-dipped galvanized steel pipe conforming to ASTM F 1083, plain ends, standard weight (Schedule 40) with not less than 1.8 oz. zinc per sq. ft. of surface area.
  - b. Type II pipe: not applicable.
  - c. Square posts where noted on the Drawings.
2. Top, Bottom and Horizontal Intermediate Rails:
  - a. Top, bottom and horizontal intermediate rails (as applicable) shall be as shown on the Drawings.
3. Gate Frames: Furnish frames (single or double gate), for nominal gate widths as shown on the Drawings.

E. Fittings and Accessories

1. Material: Comply with ASTM F 626. Mill-finished aluminum or galvanized iron or steel, in accordance with Manufacturer's standards.
  - a. Zinc Coating: Unless specified otherwise, steel fence fittings and accessories shall be galvanized in accordance with ASTM A 153, with zinc weights per Table 1 of ASTM A153.
2. Tension Wire: 7 gauge (0.177 inch diameter) coil spring steel with finish to match fabric.
3. Tie Wires: 9 gauge (0.148 inch diameter) steel with finish to match fabric.
4. Post and Line Caps: Provide weather tight closure cap for each post. Provide line post caps with loop to receive wire or top rail with finish to match fabric.
5. Tension Bars: Hot dipped galvanized steel with minimum length two inches (2") less than full height of fabric, minimum cross-section of 3/16 inch by 3/4 inch and minimum of 1.2 oz. zinc coating per sq. ft. of surface area.
6. Tension Clips: Minimum 3/4 inch wide 12 gauge (0.105 inch) thick with finish to match fabric.
7. Truss Rods: Hot dipped galvanized steel rods with minimum diameter of 5/16 inches (5/16") (7.9 mm).
8. Hinges: Master Halco heavy duty for maintenance gates, or acceptable equal.
9. Accessible gates with hydraulic hinges, self-closing and adjustable speed shall have Locinox Mammoth 180 Self-Closing Hinge Sets or approved equal. Adjust and maintain gate so that from the open position of 70 degrees, the gate shall move to the closed position in 1.5 seconds minimum (11B-404.2.8.2).

10. Accessible gates with closers shall have LCN 4040XP with MKH-100 hinges, or approved equal. Adjust and maintain gate so that from the open position of 90 degrees, the gate shall move to a position of 12 degrees from the latch in 5 seconds minimum (11B-404.2.8.1).
11. Handle with Key Lock: Shall be as specified on the Drawings.
12. Push bar/Panic exit hardware: Shall be as specified on the Drawings.
13. Lockable Galvanized Steel Butterfly Latch: Shall be as specified on the Drawings.
14. Drop Rod Assembly: Shall be as specified on the Drawings.
15. Provide or fabricate all mounting hardware as required for hinges, closers, lever handles, strike plates and panic hardware.
16. Concrete: Concrete for footings shall conform to the requirements of ASTM C94, normal Portland cement, 3000 psi at twenty-eight (28) days, four inch (4") slump. Refer to Section 03 3000 - Cast-In-Place Concrete.

### **PART 3 EXECUTION**

#### **3.01 PREPARATION**

- A. Prior to excavation, layout all fencing locations for review and acceptance by Engineer.

#### **3.02 INSTALLATION**

- A. Chain link fencing shall be constructed as shown on the Drawings and a height therein specified. The line of the fence shall be cleared of all obstructions and surface irregularities and the bottom of the fence shall be to uniform grade.
- B. Unless otherwise set forth in the Drawings, all fences shall be constructed with a top rail, and bottom rail.
- C. The posts shall be spaced as specified on the Drawings. Terminal posts and gate posts shall be set as specified on Drawings. Line posts shall be set as specified on Drawings.
- D. Post shall be set as specified on the Drawings.
- E. Concrete bases for terminal, line, and gate posts shall be allowed to cure for not less than seven (7) days before wire fabric is placed.
- F. Fabric shall be fastened to line posts with fabric bands spaced approximately fourteen inches (14") apart and to top rail and bottom tension wire with tie wires spaced approximately twenty-four inches (24") apart.
- G. Stretcher bar and truss bands shall be spread and slipped on end, corner, pull, brace, and gate posts before installation of top rails. Extension joints shall be provided from rails at intervals of one hundred feet (100'). Bottom tension wire shall be seven (7) gauge galvanized coil spring steel.
- H. Pass top rail through line post tops to form continuous bracing. Install seven inch (7") long couplings midspan at pipe ends.
- I. The placing of the rails, braces, and the wire fabric shall be accomplished in such a manner that the finished fence shall be taut, true, and of precise workmanship throughout. The fabric shall be stretched so that no slack sections remain at any point. The fabric shall be securely tied to posts and rails in a manner so that the fabric will remain tight and immovable.
- J. Position bottom of fabric three inches (2") above finished grade, or as shown on the Drawings.

- K. Cut and peen bolts so that bolts protrude one quarter inch (1/4") maximum beyond nuts and there are no sharp edges.

**END OF SECTION**

**SECTION 32 8400**  
**IRRIGATION SYSTEM**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.
- B. The General Conditions and all other Contract Documents for this project are complementary and applicable to this Section of the Specifications.
- C. Work Included:

Order and furnish all labor, materials, supplies, tools and transportation and perform all operations in connection with and reasonably incidental to the complete installation of the automatic irrigation system as shown on the Drawings. Items listed hereinafter are included as an aid to estimating quantities and are not necessarily a complete list of work items.

  - 1. Trenching, stockpiling excavation materials and refilling trenches.
  - 2. Furnishing materials and installation for complete system including piping, valves and fittings.
  - 3. Replacement of unsatisfactory materials.
  - 4. Clean-up, inspection and approval.
  - 5. All work of every description mentioned in the Specification and/or addenda thereto, and all other labor and materials reasonably incidental to the satisfactory completion of the work, including clean-up of the site, as directed by the Engineer.
  - 6. Tests.
  - 7. Record Drawings.
- D. Related Work Described Elsewhere:
  - 1. Earthwork.
  - 2. Civil.
  - 3. Storm Drainage.
  - 4. Landscape Planting.

**1.02 GENERAL REQUIREMENTS**

- A. Purpose:
- B. It is the intention of these Specifications to accomplish the work of installing an irrigation system as shown on the plans. The Drawings indicate the general arrangement of piping and equipment, and do not necessarily indicate all offsets, fittings and accessories that may be required. Furnish incidental materials and labor not specifically called for but required to complete work as intended.
- C. OSHA Compliance: All articles and services covered by this Specification are to meet or exceed the safety standards established under the Federal Occupational Safety and Health Act of 1970, together with all amendments in effect as of the date of this Specification.
- D. Codes and Standards: Comply with all applicable codes and standards.

1. Work and materials shall be in full accordance with the latest rules and regulations of the National Electric Code, the Uniform Plumbing Code, published by the Western Plumbing Officials Association and other applicable State or local laws or regulations. Nothing in these Drawings or Specifications shall be construed to permit work not conforming to these codes.
2. When the Specifications call for materials or construction of a better quality or larger size than required by the above mentioned rules and regulations, the provision of the Specifications take precedence over the requirements of the said rules and regulations.
3. Furnish, without any additional cost to the City, any additional material and labor required to comply with these rules and regulations. Do the work even if it is not mentioned in this section, or shown on the Drawings.
4. Erect and maintain barricades, guards, warning signs and lights as required by the Engineer or required by OSHA regulations for the protection of the public or workmen.
5. Damage by leaks: The Contractor shall be responsible for damages to any property or work caused by leaks in the piping systems being installed. Repair, at no additional expense to the City, all damages so caused. All repair work shall be done as directed, and in a manner satisfactory to the Engineer.
6. Protection: The Contractor shall be responsible for any damage to this work, which occurs before final acceptance. Securely cover all openings into the systems and protect all apparatus, equipment and appliances, both before and after being set in place, to prevent obstructions in the pipes and breakage, misuse or disfigurement of the apparatus, equipment or appliance.

#### **1.03 QUALITY ASSURANCE**

- A. Provide evidence to the Engineer that skilled and an experienced supervisor and work crew will be employed on the job from beginning to end.
- B. Provide evidence to the Engineer that the contractor is skilled and experienced in the construction of piping using iron fittings with push-on rubber ring gasketed fittings, joint restraints, and/or thrust blocks. Contractor shall provide with the bid documents a list of at least five irrigation projects constructed in the last five years by the contractor that have used this piping method.

#### **1.04 LAYOUT OF WORK**

- A. Stake out the irrigation system as shown on the Drawings. Obtain approval from the Engineer before starting work.

#### **1.05 INSTRUCTION**

- A. After the system has been installed and approved, instruct the City in the complete operation and maintenance of the irrigation system.

#### **1.06 SUBMITTALS**

- A. Provide submittals in accordance with Division 1 requirements.
- B. Equipment List and Drawings:

1. Within 15 days following notification of award of the contract, submit to the Engineer for approval, a list of the proposed equipment and material to be furnished and installed. The list shall be complete as to name of manufacturer, size and catalog number of unit, and be supplemented by such other data as may be required, including detailed scale drawings, and plumbing. Submit all of the above data in duplicate for checking. Following checking, correcting and approval, submit to the Engineer.

Submit materials list using the following format:

<u>Item</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model No.</u>
1	Pressure Supply Line	Lasco	Sch. 40
2	Quick Coupling Valve	Rain Bird	44 NP
etc.	etc.	etc.	etc.

2. Record Drawings:
3. Record accurately on one set of prints, changes in the work constituting departures from the original contract drawings, including changes in pressure line location.
4. Record the changes and dimensions in a legible manner and to the satisfaction of the Engineer. Prior to final inspection of work, and prior to transferring the information to mylars, submit record prints to the Engineer for approval.
5. Dimension from two permanent points of reference (buildings, monuments, sidewalks, curbs, pavements, etc.). Record data to be shown on record prints, day-to-day, as the project is being installed.
6. Show locations and depths of the following items:
  7. Point of connection.
  8. Routing of constant pressure pipe lines
  9. (dimension maximum 100 feet along routing).
  10. Gate valves.
  11. Quick coupling valves.
  12. Sleeves
  13. Related equipment (as may be directed by Engineer).
  14. Maintain record prints on-site at all times.
  15. Upon completion of work, transfer all as-built information and dimensions to reproducible sepia mylars. Correct and record the changes and dimensions in a legible manner, to the satisfaction of the Engineer. Record Drawings shall be included in the bid price and no separate payment will be made.

## **PART 2 PRODUCTS**

### **2.01 PIPE**

- A. Pipe Manufacturer: PW Pipe, JM Pipe or approved equal.
- B. Pipe Material: Polyvinylchloride (PVC) plastic in conformance with ASTM D1784 (cell class 12454-B).
- C. Schedule or Class:
  1. Main Line Pipe:
    - a. 2-1/2 inch and smaller: Schedule 40 PVC plastic pipe with solvent cemented joints.
    - b. Note: No 3 inch diameter main line pipe shall be used on the project.
- D. Identification Marking:

1. Pipe shall be clearly marked at regular intervals indicating the manufacturer's name, nominal pipe size, schedule or class, pressure rating in PSI, and date of extrusion.
2. Recycled water: In addition to the above identification the pipe material shall be a purple color and clearly marked to indicate the use of recycled water. The pipe shall have text on opposite sides to read "CAUTION: RECYCLED WATER - DO NOT DRINK" in intervals not to exceed five (5) feet with 3/8 inch high letters.

E. Assembly:

1. Solvent-Weld Main Line: At changes in direction or branch mains, use appropriate Schedule 80 PVC fittings as approved by the Uniform Plumbing Code.

F. Sleeves:

1. Sleeves: 1120-Class 200 PVC pipe, minimum of two times the diameter of pipe contained within.

## 2.02 PIPE FITTINGS

- A. Fitting Manufacturer: Dura, Spears, Lasco, Harco, Leemco or approved equal.
- B. Metallic bolts, nuts, or studs below grade: 316 or 304 SS.
- C. Schedule or Class:
  1. 2.5-inch and smaller main line pipe: Schedule 80 PVC plastic with solvent cemented or threaded joints as shown on the Drawings.

## 2.03 GATE AND BALL VALVES

- A. Manufacturer: Nibco
- B. Provide the gate and ball valves as listed on the Drawings.

## 2.04 REMOTE CONTROL VALVE

- A. Manufacturer: Griswold Controls.
- B. Provide the remote control valve with integral ball valve and union as listed on the Drawings.

## 2.05 QUICK COUPLER VALVES

- A. Manufacturer: 1" Weathermatic (in landscape) and 1.5" Weathermatic (in synthetic turf).
- B. Provide the one or two-piece, locking, and rubber covered quick coupler valves as listed on the Drawings.
- C. Valves are to indicate recycled water use clearly on a purple rubber cover and/or recycled water tag.

## 2.06 BOXES FOR REMOTE CONTROL VALVES, GATE VALVES, AND QUICK COUPLING VALVES

- A. Remote Control Valve: Christy Model N36BOX/N36T 17-1/8 inch x 30-1/4 inch (inside bottom dimensions) x 12 inch deep valve box with bolt-down reinforced concrete lid, N90 bolt-down kit, or approved equal. Lid shall be marked: "Irrigation Valve".
- B. Remote Control Valve: Christy Model N16BOX/N16T 11-3/4 inch x 22-31/4 inch (inside bottom dimensions) x 12 inch deep valve box with bolt-down reinforced concrete lid, N90 bolt-down kit, or approved equal. Lid shall be marked: "Irrigation Valve".

- C. Gate valve and Quick Coupling Valve: Christy Model G05TBOX/G05CT 10-3/8 inch I.D. x 12 inch deep traffic valve box with bolt-down cast iron lid or approved equal. Lid shall be marked: "Irrigation". Use ADS plastic extensions provided by box manufacturer.
- D. Use concrete box extensions as required, made by the same manufacturer and of equal size to the valve box.
- E. Provide with cover, 3/8-inch cadmium plated hold down bolt(s) with cadmium plated washers and nuts, quantity as required. Nuts shall be recessed below the surface of the cover. Bolts, washers, and hardware are sold separately by the manufacturer and shall be corrosion proof.
- F. Box lid shall indicate the use of recycled water. The valve box lid shall be a recycled water purple color, colored or painted by the contractor or vendor. The box body shall be a standard concrete color.

#### **2.07 BOXES FOR QUICK COUPLING VALVES LOCATED IN SYNTHETIC TURF**

- A. Metallic valve box, square, Sportsfield Specialties model TCITQCV (turf) as detailed on the Drawings.

#### **2.08 IRRIGATION HEADS AND BUBBLERS**

- A. Provide and install the spray heads and bubblers as listed on the Drawings.
- B. Irrigation head, body and risers: Provide and install bodies and risers as shown in the construction details using Schedule 80 PVC threaded nipples with Schedule 80 PVC elbows, Engineer approved vendor pre-fabricated swing joints, or algae resistant flexible PVC tubing.

#### **2.09 MISCELLANEOUS INSTALLATION MATERIALS**

- A. Solvent cement and primer for solvent weld joints: Make and type approved by manufacturer(s) of pipe and fittings. Maintain cement at proper consistency throughout use.
- B. Pipe joint compound: Non-hardening, non-toxic materials designed specifically for use on threaded connections in water carrying pipe. Rectorseal T+2 pipe thread sealant or equal.

#### **2.10 MISCELLANEOUS EQUIPMENT**

- A. Provide all equipment called for by the Drawings.

### **PART 3 INSTALLATION**

#### **3.01 PREPARATION**

- A. General:
  - 1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that their work is complete or to the point where this installation may properly commence.
  - 2. Verify that irrigation system can be installed in strict accordance with pertinent codes and regulations, the original design, the referenced standards and the manufacturer's recommendations.
  - 3. In the event any equipment or methods indicated on the drawings or in specifications is in conflict with local codes, immediately notify the Engineer prior to installing. If this notification is not provided, assume full responsibility for the cost of any and all revisions necessary to comply with code.



- B. Grades:
  - 1. Before starting work, carefully check grades to determine that work may safely proceed, keeping within the specified material depths with respect to finish grade.
- C. Coordination with Work of Other Trades:
  - 1. Provide all necessary measurements in the field to ensure precise fit of items in accordance with the original design.
  - 2. Coordinate the installation of irrigation materials with all other work.
  - 3. Give special attention to coordination of piping locations with new and existing signage, light standards, hydrants, and other utility locations to avoid conflicts.
- D. Water Supply:
  - 1. Connect the existing irrigation water supply to location as shown on the Drawings.
  - 2. Make minor changes caused by actual site conditions at no additional cost to the City.

### **3.02 HANDLING AND STORAGE**

- A. Protect work and materials from damage during construction and storage as directed by Engineer.
- B. Handle plastic pipe carefully; especially protect it from prolonged exposure to sunlight.

### **3.03 LAYOUT**

- A. Lay out work in accordance with diagrammatic construction drawings.
- B. Where site conditions do not permit location of piping, valves and heads where shown, notify the Engineer immediately and determine relocation in joint conference.
- C. Run pipelines and automatic control wiring in common trenches wherever practical. When pipe and wire area placed in the same trench, it is required that a minimum separation of 3 inches be maintained between pipes and/or pipes and wiring.

### **3.04 EXCAVATING AND TRENCHING**

- A. Excavate trenches ample in size to permit the pipes to be laid at the elevations intended and to permit ample space for joining. When two pipes are to be placed in the same trench, maintain a minimum of 3-inch clearance between pipes.
- B. Make trenches for pipelines deep enough to provide minimum cover from finish grade as follows:
  - 1. 2-1/2 inch diameter and smaller: 18-inch minimum cover over main lines to control valves and quick coupling valves.
- C. Restore surfaces, existing underground installations, utilities, plant materials, etc., damaged or cut as a result of excavations, to original conditions in manner approved by the Engineer.
- D. Where other utilities interfere with irrigation trenching and pipe work, adjust the trench depth as instructed by the Engineer.

### **3.05 ASSEMBLING PIPELINES**

- A. Assemble pipe free from dirt and pipe scale. Ream field cut ends to full pipe diameter with rough edges and burrs removed.
- B. Solvent Weld Joint:
  - 1. Prepare joint by first making sure the pipe end is square, then deburring the pipe end and cleaning pipe and fittings of dirt, dust and moisture.
  - 2. Dry-insert pipe into fitting. Pipe should enter fitting 1/3 to 2/3 depth of socket.

3. Coat the inside of socket surface of the fitting and the external surface of the male end of the pipe with solvent cement primer (P-70 as manufactured by Weld-On or approved equal). Then without delay, apply solvent cement (Weld-On 711 as manufactured by Weld-On or approved equal) liberally to the male end of the pipe and also apply solvent cement lightly to the inside of the socket. At this time, apply a second coat of solvent cement to the pipe end. (Solvent cement with primer incorporated into the solvent cement may be used.)
  4. Insert pipe immediately into fitting and turn ¼ turn to distribute cement and remove air bubbles. The pipe must seat to the bottom of the socket and fitting. Check alignment of the fitting. Align the pipe and fitting properly to prove no strain to either.
  5. Hold joint still for approximately thirty (30) seconds and then wipe excess cement from the pipe and fitting.
  6. Cure joints a minimum of thirty (30) minutes before handling and at least six (6) hours before allowing water in the pipe.
- C. Threaded Joint:
1. Field threading of plastic pipe or fittings is not permitted. Provide factory-formed threads only.
  2. Field-cut threads in metallic pipe will be permitted only where absolutely necessary. When field threading, cut threads accurately an axis with sharp dies.
  3. Provide threaded joints with pipe joint compound. Apply compound to male threads and first two female threads only.
  4. Where assembling metallic pipe to metallic fitting or valve, no more than one full turn beyond hand tight.
  5. Where assembling to threaded plastic fitting, take up joint no more than one full turn beyond hand tight.
  6. Where assembling soft metal (brass or copper) or plastic pipe, use strap type friction wrench only; do not use metal-jawed wrench.
- D. Cap or unplug openings as pipeline is assembled to prevent entrance of dirt or obstruction. Remove caps or plugs only when necessary to continue assembly.
- E. Where pipes or control wires pass through sleeves, provide removable non-decaying plug at ends of sleeve to prevent entrance of earth.

### 3.06 SLEEVES

- A. Install sleeves to carry main line pipe or future pipe under concrete and asphalt surfaces. Provide a sleeve even if the Drawings do not indicate a sleeve under the concrete and asphalt surfaces.
- B. Install a 2-inch pvc electrical conduit to carry future control wires under concrete and asphalt surfaces where a sleeve does not exist for main and/or future lateral line pipe.
- C. Sleeves and/or conduit under existing paving: Bore for sleeves and/or conduit under existing paving and extend 12 inches beyond paving edge. Provide a separate sleeve for each water line and conduit for electrical control wires.

### 3.07 VALVE BOXES

- A. Provide and install gate valves in a valve box as shown in details, complete with cover bolted to valve box.
- B. Set valve boxes to finish grade in turf areas and 2 inches above finish grade in groundcover areas.

- C. Do not allow valve boxes to rest on pipes.
- D. Provide a minimum 2-inch clear distance between valve and the box wall.
- E. Install valve boxes located near walks, curbs, and paving in such a way as to allow for valve boxes to abut those items with top lid surface matching plane of items listed above.

### 3.08 BACKFILLING

- A. Backfill only after piping has been tested, inspected and approved.
- B. Lay main line pipe and control wiring on a 4-inch bed of clean sand on bottom of trench.
- C. Backfill material above sand: earth excavated from the trenches, free from rocks, concrete chunks and other foreign or coarse materials.
- D. Place backfill materials in 4-inch layers and compact to a minimum compaction of 92 percent of original soil density.
- E. Dress areas to finish grades and remove excess oil, rocks or debris remaining after backfill is completed.
- F. If settlement occurs along trenches, and adjustments in pipes, vales and sprinkler heads, soil, sod or paving are necessary to bring the system, soil, sod or paving to the proper level or the permanent grade, as part of the work under this Contract, make all adjustments without additional cost to the City.

### 3.09 QUICK COUPLER VALVES

- A. Thoroughly flush lines before installing QCV's.
- B. Locate QCV's as shown in the Drawings and detail.
- C. Install turf heads 2 inches above grade in seeded lawn area at time of installation. Lower to finished grade after turf is well established and as directed by the Engineer.

### 3.10 TESTS

- A. Perform tests as specified below. Remake any faulty joints with new materials. Use of cement or caulking to seal leaks is absolutely prohibited.
- B. Record Prints:
  - 1. No testing or system observation shall commence without "record" prints. In the event the Contractor calls for testing or system observation without up to date "record" prints, without completing previously noted corrections, or without preparing the system for testing or system observation, the testing or system observation will be canceled and the Contractor will be charged for the direct costs of all City personnel's time and consultant's time lost.
- C. Testing or system observation will be required for:
  - 1. Pressure test of irrigation main line.
  - 2. Final observation/start of maintenance.
  - 3. Final acceptance.
- D. Notify the Engineer at least three (3) days in advance of testing.
- E. Perform testing at no additional expense to the City and in the presence of Engineer.
- F. Center load piping with small amount of backfill to prevent arching or slipping under pressure. No fitting shall be covered.

- G. Apply the following tests after weld plastic pipe joints have cured at least 24 hours.
  - 1. Prior to the installation of any valves, expel air from piping, cap ends of pipe and test pressure lines with the line fully charged with water.
  - 2. Test live (constant pressure), QCV lines within the synthetic turf field hydrostatically at 125-psi minimum. Lines will be approved if test pressure is maintained for two (2) hours. The lines shall be restored to do so shall be measured. Approved tables of allowable loss will be consulted, and the lines will be approved or not approved as such results may indicate. Subcontractor shall make tests and repairs as necessary until test conditions are met.

**3.11 GUARANTEE**

- A. Unconditionally guarantee the entire sprinkler system for material and installation, including settling of backfilled areas below grade for a minimum period of one year following the date of final acceptance of the work.
  
- B. Submit a guarantee on Contractor letterhead as follows:

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse, or neglect excepted, and that the work, materials and equipment as installed will fulfill the requirements of the guarantee included in the specifications. We agree to repair or replace any or all of our work, together with any other adjacent work which may be displaced by doing so, that may prove to be defective in materials and installation within a period of one (1) year from date of acceptance of the below named project in the City of Petaluma, at no additional cost to the City. We shall make such repairs or replacement of the work within seven (7) calendar days of written notification by the City. When the immediate repair or replacement of the work is necessary to ensure the public safety and welfare, which would be endangered by continued usage of the facility, such circumstance will be deemed an operational emergency. In the event of such an emergency after the City contacts our firm and after authorizing 24 hours to initiate repairs, if we fail to initiate and diligently complete such repairs in a timely manner, the Engineer may direct City forces to perform such functions as may be necessary to correct the work and immediately place the facility back in operations condition. If such procedure is implemented, we shall bear all expenses incurred by the City. In all cases, the judgment of the Engineer shall be final in determining whether an operational emergency exists. In the event of our failure to make such repairs or replacements within the times specified after receipt of written notice from the City (other than an operational emergency), we authorize the City to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT: \_\_\_\_\_

LOCATION: \_\_\_\_\_

SIGNED: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

PHONE: \_\_\_\_\_

- C. If, within one year following acceptance of the work, settlement occurs and adjustments in pipes, valves or paving is necessary to bring the system or paving to the proper level of the permanent grades, as part of the work under this Contract, make all adjustments without extra cost to the City, including the complete restoration of all damaged planting, paving or other improvements of any kind.
- D. Should any operational difficulties in connection with the sprinkler system develop within the specified guarantee period which in the opinion of the City may be due to inferior material and/or workmanship, correct said difficulties immediately and to the satisfaction of the City and at no additional cost to the City, including any and all other damage caused by such defects.

### 3.12 CLEAN UP

- A. Upon completion of the work, and at other times as may be directed, smooth all ground surfaces; remove excess materials, rubbish, debris, etc., sweep adjacent streets, curbs, gutters and trails and remove construction equipment from the premises.

### 3.13 MAINTENANCE

- A. Properly and completely maintain the irrigation system.
- B. Operation and Maintenance Manuals: Within 10 calendar days prior to acceptance of construction, prepare and deliver to the Engineer all required descriptive materials, properly prepared in two individually bound copies of the operation and maintenance manual. The manual shall describe the material installed and be in sufficient detail to permit operating personnel to understand, operate and maintain all equipment. Include spare parts lists and related manufacturer's information for each equipment item installed. Each complete, bound manual shall include the following information:
  - 1. Index sheet stating Contractor's address and telephone, including names and addresses of local manufacturer's representative.
  - 2. Complete operating and maintenance instructions on all major equipment.
- C. Materials to be furnished:
  - 1. Supply as part of the contract the following spare parts:
    - a. Standard QCV: Two (2) coupler keys with a 3/4 inch bronze hose bib, bent nose type with hand wheel.
    - b. Synthetic turf QCV: One (1) coupler key.
    - c. "As-built" sepia mylars from "record" prints.
    - d. Gate valve: one key.
    - e. Decoder: One (1) decoder.
    - f. Pop-up spray head bodies: Five (5) total of each manufacturer.
    - g. Bubbler heads: Five (5) total of each type.
    - h. Hand-held remote for controller: One (1) total.
  - 2. Turnover the above spare parts over to the Engineer at the final observation.

**END OF SECTION**

**SECTION 32 9000**  
**LANDSCAPE PLANTING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.
- B. Work Included:
  - 1. Furnish all plant materials.
  - 2. Furnish all labor, equipment and materials necessary for landscape planting installation and maintenance according to these Specifications.
- C. Related Work:
  - 1. Section 32 8400: Irrigation System
  - 2. Irrigation system shall be installed and operative before beginning planting operation. Contractor shall fully acquaint themselves with the existing conditions, particularly in reference to underground piping. Any damage caused by the Contractor to work of other trades shall be repaired by them at no cost to the City.

**1.02 COORDINATION**

- A. Coordinate work fully with all other trades involved. Coordinate with items of other trades to be furnished and set in place. Such portions of their work as is all or in part embedded, built-in, attached to, or supported by the work shall be executed by them in ample time that progress of the work is not delayed. Contractor shall be responsible for the proper installation of all items related to this section.
- B. Contractor shall coordinate with the Engineer and fully acquaint themselves with the existing conditions including but not limited to existing and proposed underground utilities. Any damage caused by the Contractor to work of other trades shall be repaired by them at no cost to the City.

**1.03 REFERENCE**

- A. Perform work in accordance with all applicable laws, codes and regulations, as required by the Engineer.
- B. Reference to "Standard Specifications" shall mean the current Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS.

**1.04 QUALITY ASSURANCE**

- A. Personnel:

All planting shall be performed by personnel familiar with planting procedures under the supervision of a qualified foreman.
- B. Codes and Standards:

Nursery stock shall meet the standards of the current edition of the "Agricultural Code of

California” and the “Regulations of the Director of Agriculture Pertaining to Nursery Stock” as to grading and quality. They shall be true to type and name in accordance with “Standardized Plant Names, Second Edition.”

- C. Substitutions:  
No substitutions shall be permitted without approval of the Engineer. The City reserves the right to require the Contractor to replace at the Contractor’s cost any plants which the Contractor has installed without the Engineer’s approval.
- D. Plants shall be subject to inspection and approval of the Engineer at place of growth or upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during progress of the work.

#### **1.05 SUBMITTALS**

- A. Plant Certification:  
All plants must meet specifications of Federal, State and County laws requiring inspection for plant disease and insect infestations. Inspection certifications required by law shall accompany each shipment, invoice and order for stock.
- B. Plant Material:  
Contractor shall submit nursery sources for all plant material, clearly stating Botanical Name and container size. Additionally, Contractor shall submit photos from the sources and size specification including container size, height, diameter, and trunk caliper.
- C. Topsoil, Amendment and Fertilizer:  
Provide current, accurate analysis from an approved testing laboratory.
- D. Mycorrhizae planting backfill.
- E. Soils Fertility Laboratory Test Results
  - 1. Four (4) separate planting areas. Submit proposed locations to the Landscape Architect prior to testing.
- F. Tree Stakes and ties as indicated on the Drawings.
- G. Root Barriers as indicated on the Drawings.
- H. Mulch as indicated on the Drawings.

#### **1.06 JOB CONDITIONS**

- A. Delivery
  - 1. Deliver fertilizer and amendments to site in original, unopened containers bearing manufacturer’s guaranteed chemical analysis, name, trade mark and conformance to state law.
  - 2. Deliver plants with identification labels.
    - a. Labels shall state correct name and size.
    - b. Use durable, water-proof labels with water resistant ink that will remain legible for at least 60 days.
  - 3. Protect plant materials during transport to prevent damage to rootball or desiccation of leaves.
  - 4. Remove unacceptable plant materials immediately from job site.
- B. Storage



1. Contractor shall maintain the plant material properly between delivery and planting. This includes protection from animals and vandals; proper watering, and feeding when necessary.
2. Shade plants shall be stored in the shade, and sun plants shall be stored in the sun.

C. Timing

1. Under no circumstances shall any work be performed when the temperature exceeds 90 degrees or is below 40 degrees. No planting shall be done with the soil saturated with water.

**PART 2 PRODUCTS**

**2.01 SOIL AMENDMENTS**

- A. The following Top Soil, organic amendments, and fertilizer rates and quantities are to be used for bid basis only. Contractor shall arrange and pay for testing by an accredited soils laboratory of existing site soil after rough grading operations are complete, and shall amend the soils according to said laboratory's recommendations. The soils recommendations shall be considered a part of this specification.
- B. Topsoil: Provide topsoil as required to complete landscape work.
1. Topsoil may include clean on-site material that has been previously stripped from the top 6 inches of original grade or acceptable import material (as applicable). Acceptable topsoil shall be free from "rocks" (rock, stones, rubble, clay clods, etc. over 1" in diameter), roots, toxins, and any other deleterious material per the discretion of the Engineer. All import topsoil proposed for use shall be submitted to the Engineer for review and acceptance prior to use. Submit samples and current soil fertility and structure analyses for approval by the Engineer.
  2. Topsoil to be furnished shall be fertile and friable, possessing characteristics of representative productive soils on the site. It shall not contain toxic substances which may be harmful to plant growth. When herbicide contamination is suspected then a radish/rye grass growth trial must be performed. Consult with the Engineer prior to decision to test. It shall be uniformly textured and free of all objectionable foreign materials, oil or chemicals which may be injurious to plant growth. Natural topsoil shall possess a pH factor between 5.5 and 7.5, a sodium absorption ratio (SAR) of less than 8, a boron concentration of the saturation extract of less than 1 ppm, and salinity of the saturation extract at 25 degrees C. of less than 4.0 millimhos per centimeter. Obtain topsoil from naturally well-drained sites where topsoil occurs in a depth of not less than four inches (4"); do not obtain from bogs or marshes.
- C. Organic Amendment
1. Physical Properties: A minimum of 90% of the material by weight shall pass a 1/2" screen. Material passing the 1/2" screen shall meet the following criteria:

% Passing	Sieve Designation	
85-100	9.51 mm	3/8"
50-80	2.38 mm	No. 8
0-40	500 micron	No. 35
  2. Source material: Fully composted organic green waste.
  3. Carbon and Nitrogen ratio: Maximum 35:1 if material is claimed to be nitrogen stabilized.
  4. Organic matter: Minimum 50% based on dry weight and determined by ash method. Minimum 270 lbs. organic matter per cubic yard of compost.
  5. Iron content: Minimum 0.08% dilute acid soluble iron based on dry weight; iron treated.
  6. Salinity (ECe): 4.5 dS/m maximum @ 25 degrees C. as determined in a saturation extract.

7. Reaction (pH): Minimum: 5.5, Maximum: 8.0 as determined in saturated paste.
8. Moisture content 35% - 60%.
9. Contaminants: the compost shall be free of contaminants such as glass, metal and plastic.
10. Maturity: Shall exhibit visible characteristics of maturity, including: dark brown to black color. Acceptable odor: moldy/musty, soil like, or none. Unacceptable odor: sour, ammonia or putrid.
11. Appearance: Identifiable wood pieces are acceptable, but the balance of the material should be soil like, without recognizable leaves.

D. Fertilizer

1. Fertilizer shall be a commercial inorganic fertilizer in the granular or pelleted form. Fertilizer shall be delivered to the site in containers labeled in accordance with the applicable State of California regulations, bearing the warranty of the producer or the grade furnished, and shall be uniform in composition, dry and free-flowing.
2. Planting Areas:
  - a. 6N-24P-24K, and 16-6-8, pelleted type.
  - b. Sulphate - sulphur
  - c. Lime for pH adjustment of moderately acid soil
  - d. Starting one (1) month after planting, on a monthly basis, 21N-0P-0K Ammonium sulfate. 5 lbs. per 1,000 square feet.
3. Trees:
  - a. 21 gram 20N-10P-5K slow release fertilizer tablets as manufactured by Agriform. Apply according to manufacturer's instructions.
  - b. After planting: 21N-0P-0K Ammonium sulfate 5 lbs. per 1,000 square feet.

E. Mycorrhizae Planting Backfill

1. MycoApply Endo/Ecto Plus, available from Mycorrhizal Applications, Inc., [www.mycorrhizae.com](http://www.mycorrhizae.com).

**2.02 CONTAINER PLANTS**

- A. All plant materials shall be nursery grown in accordance with the best known horticultural practices and under climatic conditions similar to those in the locality of the project.
- B. Plants shall be vigorous and shall have a normal habit of growth. Plants shall be free of damage by insects, pests, diseases or wind; burns from insecticides or fertilizer; and stunted growth due to lack of water, lack of food, diseases or other causes. Plants shall be in conformity with the sizes shown on the Drawings.
- C. Trees
  1. Unless otherwise specified, tree trunks shall be straight with leader intact, undamaged and uncut. All old abrasions and cuts are acceptable only when completely callused over.
- D. Quantities
  1. Quantities necessary to complete the work as shown on the Drawings shall be furnished.
- E. Root Systems
  1. All trees shall have a normal root system. No plants with roots that have encircled themselves will be accepted. In case of any unsatisfactory root system, a total group of plants may be rejected.

**2.03 ROOT BARRIER**

- A. Root barrier shall be installed between trees and pavement when trees are located within eight feet (8') of pavement. Root barrier shall run parallel to pavement for a minimum of 10'.
- B. Root barrier units shall be Deep Root Barrier, as shown on the Drawings, manufactured by Deep Root Partners, (800) 458-7668, or approved equal.

### **PART 3 INSTALLATION**

#### **3.01 SURFACE CONDITIONS**

- A. Inspections by the Landscape Contractor
  - 1. Prior to all work in this section, verify grades and carefully inspect the installed work of all other trades. Verify that all such work is complete to the point where the installation may properly commence.
  - 2. All planting areas shall contain a minimum of eight (8) inches of acceptable topsoil. As applicable and where needed, only previously acceptable topsoil shall be installed.
  - 3. Inspect plant materials for injury, insect infestations and proper pruning.
  - 4. Landscape Contractor shall receive site graded to plus or minus one-tenth of a foot (0.10') of finish grades shown on the Drawings. Allow for depth of soil amendments in determining the difference between finished subgrade in planting areas. Verify that subgrades are not compacted.
  - 5. Landscape Contractor shall over excavate planting beds along the perimeter of lime treated areas to remove excess lime that was added for construction. Refer to geotechnical report for required overbuild and depth of lime to determine extent of removal. Provide new topsoil in these planting areas.
  - 6. Contaminated Soil
    - a. Do not perform any soil preparation work in areas where soil is contaminated with cement, plaster, paint or other construction debris. Bring such areas to the attention of the Engineer and do not proceed until the contaminated soil is removed and replaced.
    - b. Contaminated soil shall be removed to full depth of contaminants with a minimum depth of 12 inches and replaced with acceptable topsoil.
  - 7. Moisture Content: Soil shall not be worked when moisture content is so great that excessive compaction will occur, nor when it is so dry that dust will form in the air or that clods will not break readily. Water shall be applied, if necessary, to bring soil to an optimum moisture content for tilling and planting.
  - 8. Soil Loosening: Soil in all planting areas (only) shall be ripped or cultivated to the depths specified below. Water shall be added and ripping or cultivating shall be continued until the entire specified depth is loose and friable. All debris, pavement, concrete, and rocks over 1 inch in diameter shall be removed to the specified depth and shall be removed from the site and disposed of properly.
    - a. Slopes 2½ horizontal to 1 vertical and steeper: No loosening required.
    - b. All other areas to be planted: 12 inches deep.
  - 9. Weed Control and removal
    - a. Remove all weeds and other debris prior to any soil preparation or grading work. Weeds and debris shall be disposed of off the site properly.
    - b. Grow and Kill: After grading finish is complete, apply water in sufficient quantity over a minimum period of 14 days to germinate weed seeds. When weeds have germinated, kill them and remove them in a manner acceptable to the Engineer and that will not have a detrimental residual effect on the growth and vigor of the landscape planting work. Provide temporary irrigation as required to apply the water.

10. In the event of discrepancy, immediately notify the Engineer. Do not proceed with this installation in areas of discrepancies until all such discrepancies have been fully resolved.

### 3.02 SOIL PREPARATION

- A. In the areas designated for landscaping on the Drawings except for bioretention areas and within tree protection zones, Contractor shall, prior to placing imported material, replacing existing topsoil before doing any planting, verify that the areas are clear and free of weeds, roots, debris, rocks and underground obstructions, and construction debris to a depth acceptable for planting. Scarify the subgrade to a four inch (4") minimum depth prior to spreading topsoil. Finished grades shall be approved by the Engineer prior to commencing soil preparation and planting operations.
- B. Cultivation and Placement of Amendment
  1. In turf areas within tree protection zones, mow existing turf to one inch (1") in height, use a steel rake to remove clippings and scarify soil, and topdress with a minimum of one inch (1") of amended topsoil to provide a smooth substrate for over-seeding within the area of exposed surface roots. Place amended topsoil as required to conform to finish grade elevations shown on the Grading Plan. All work in the proximity of existing trees to remain shall follow the Tree Protection Specifications on the Drawings. Apply fertilizer in accordance with soils test results.
  2. In planting areas except for bioretention areas and within tree protection zones, cultivate soil to a depth of eight inches (8"). Prior to planting, incorporate six (6) cubic yards per 1,000 square feet of nitrified fir bark, and the following fertilizers, per 1,000 square feet: 30lbs. 6N-24P-24K to a depth of six inches (6").
- C. Soil Mix for Backfill of Trees
  1. The following ingredients shall be tumbled to achieve a homogenous mix:

Organic Amendment	1 cubic yard
Topsoil	3 cubic yards
Fertilizer	10 pounds 6N-24P-24K
- D. Finish Preparation
  1. After approval of amendment and fertilizer applications by the Engineer, incorporate into the top six inches (6") of soil by repeated rotary-hoe cultivation except within tree protection zones.
  2. When rough grading and soil conditioning has been completed, all planting areas shall be smooth graded, ready for placement of plant materials and for seeding/sod. Grading shall be done when soil is at optimum moisture content for working.
  3. Finished grades shown on the Civil Drawings are given in feet and decimals of feet. Slope uniformly between given spot elevations. Planting areas shall be true to grade within one inch when tested in any direction with a 10 foot straightedge.
  4. Grades not otherwise indicated shall be uniform levels or slopes between points where elevations are given or between points established by walks, paving, curbs or catch basins. Finished grades shall be smooth even and on a uniform plane with no abrupt change of surface. Adjustments of finish grades shall be made at the direction of the Engineer.
  5. All grades shall provide for natural runoff of water without low spots or pockets. Flow line grades shall be accurately set and shall not be less than 2 percent gradient wherever possible unless otherwise indicated on the Drawings.
  6. Tops and toes of all slopes shall be rounded to produce a gradual and natural-appearing transition between relatively level areas and slopes.
  7. Roll to compact amended soil to not more than 85% compaction.

8. Finish out to a smooth, even surface conforming to established grades after settlement. Rake immediately prior to planting.
11. If rain is likely between completion of soil preparation and planting, precaution shall be taken to prevent erosion of the soil.

### 3.03 CONTAINER PLANTS

#### A. Preparation

1. Place plants in containers in the locations indicated on the Drawings and obtain the approval of the Engineer before digging. Maintain plants as required for optimal condition until approved for installation.
2. The Contractor shall protect all utilities, vegetation and structures during work.

#### B. Excavation

1. All plant pits shall be dug circular in outline and with vertical walls. The sides and bottoms of all planting pits shall be thoroughly scarified.
2. Holes for fifteen (15) gallon size plants or larger: twenty-four inches (24") wider than the can or rootball.
3. After pits are dug, break sides to open wall of pit for root penetration and loosen bottom of pit to a depth of three inches (3"). Construct a foot tamped mound in bottom of pit to support plant at proper level.
4. Following excavation of planting holes and prior to placing backfill, fill planting hole with water to a depth of 6", and allow water to percolate into existing soil for 24 hours. Any planting holes not drained within 24 hours shall have drainage holes drilled to a depth that allows planting hole to drain or install subdrain from planting pit to storm drain system as directed by the Engineer. After drilling drainage hole or installing subdrain, refill with water and repeat process above as directed by the Engineer.

#### C. Plants in Containers

1. Plants shall be removed carefully from their containers after the containers have been cut on two (2) sides minimum; fifteen (15) gallon containers shall be opened in three (3) places.
2. After removing plant material from its container, stimulate root growth by making four (4) or five (5) vertical cuts, one inch (1") deep around the circumference of the rootball.
3. Do not lift or handle plants by the top, stems or trunk at any time. All plants shall be lifted in such a manner that the rootball is supported from the underside.
4. The Contractor shall check all plants for adequate root systems. When the root system is defective, he shall remove deficient plants from the site and replace them with new ones with adequate root system.

#### D. Planting

1. Center plant in pit or trench over tamped mound.
2. Face for best effect.
3. Set plant plumb and hold rigidly in position.
4. All plants shall be set in the ground so that the rootball will be flush with the finish grade. All plants that settle below the finish grade within thirty (30) days of acceptance of the work shall be replanted in the proper position. In case a total section of planting area settles, the Contractor shall lift the plants, import additional soil mix, regrade and replant, at no additional cost to the City.
5. Use amended soil mix only for backfill. Backfill pit with soil mix in nine inch (9") layers and water each layer thoroughly to settle soil. The filled pit shall be flush with surrounding grade when complete.

- a. In the top 1" of the plant hole, mix Mycorrhizae planting backfill with the plant backfill. Evenly distribute the Mycorrhizae and place as close to rootball as possible at the following rates.
  - 4" pot or Liner: 1 teaspoon
  - # 1 gallon: 1 tablespoon
  - # 5 gallon: 4 tablespoons
  - # 15 gallon: 6 tablespoons
  - 24" box: 8 tablespoons
6. When the plant pit has been approximately one-half (1/2) filled, place planting tablets according to the manufacturer's schedule.
  - a. Planting areas shall be hand raked to remove all clods, weeds, roots, debris, and rocks 1-inch in diameter and larger.
7. Dispose of excess excavated soil (if any) on the site at no additional cost to the City.

### **3.04 TREE STAKING**

- A. Stake trees as indicated on the Drawings.
- B. Tying: Find the proper support height by holding the trunk in one hand and pulling the top to one side and releasing it. The lowest height at which the trunk will return to the upright position when the top is released is the height at which to attach tree ties. Tree stakes shall be adjusted throughout the maintenance period as necessary to insure perpendicular growth habit due to severe windy conditions.

### **3.05 PRUNING**

- A. Pruning shall be performed as required to maintain a natural appearance, promote healthy and vigorous growth and eliminate diseased or damaged growth.
- B. Trees shall be pruned to thin crown and avoid wind damage, eliminate narrow V-shaped branch forks that lack strength, eliminate sucker growth and maintain a radial branching pattern to avoid crossing branches.
- C. Under no circumstances will stripping of lower branches ("raising-up") of young trees be permitted. Lower branches shall be retained in a "tipped back" or pinched condition with as much foliage as possible to promote caliper trunk growth (tapered trunk).
- D. Major pruning of trees to compensate for root loss or for aesthetic reasons shall be done only with approval of the Engineer.
- E. All pruning shall be made flush to lateral branches, buds or trunk. "Stubbing" will not be permitted.
- F. Damage: All cuts over one inch (1") resulting from pruning or wind breakage shall be inspected periodically for insect infestation or disease.

### **3.06 PROTECTION**

- A. Protect all planted areas and plants against damage as required. If any plants are damaged, replace as directed by the Engineer with no additional cost to the City.

### **3.07 CLEAN UP**

- A. Upon completion of planting, all cans, boxes and other debris that is a part of the planting operation shall be removed from the site.

- B. All pavements shall be washed off, and site shall be left in an absolutely clean condition. All planting areas shall be cultivated and weed free before final inspection. Clean-up operations shall take place throughout the course of work so that walks and drives are clean at all times.

### **3.08 INSPECTIONS**

- A. Notification: The Contractor shall notify the Engineer a minimum of 72 hours before requiring a visit by the Landscape Architect.
- B. Check Points: The following shall be considered check points and the Contractor shall only proceed with the work after the Engineer has visited the site and determined that the work is proceeding satisfactorily.
  - 1. Completion of rough grading in planting areas. Civil Engineer shall review and approve prior to placement of topsoil, amendment and fine grading.
  - 2. After placement of topsoil, soil amendment and fine grading before planting, seeding or sodding.
  - 3. Layout of plant material. All plant material in the planting area shall be placed in the configuration shown on the Drawings prior to plant pit excavation.
  - 4. Maintenance period shall not start until all construction for the entire project is complete.
  - 5. A check visit shall be made to begin the maintenance period. At this time the Contractor shall have completed all phases of the Drawings and Specifications. Any discrepancies shall be noted at that time and the Contractor shall make appropriate corrections before beginning the maintenance period.

### **3.09 MAINTENANCE**

- A. Contractor shall furnish all labor, material, equipment and services required to maintain the landscape in a healthy and attractive condition for a period of ninety (90) calendar days.
- B. Maintenance shall include fertilization, watering, insect and disease control, animal/pest control, netting or cages to protect plants, weed control, mowing, pruning, restaking, continual checking, adjusting, programming and making all necessary repairs to the automatic irrigation system, cleaning of pavement, replenishment of bark mulch, and weekly trash removal from all project site areas. All chemical use shall conform to City's standards for application and notification.
- C. No later than two (2) calendar weeks prior to the end of the maintenance period, the Contractor shall request in writing a review of the work by the Engineer. When, upon review, the Engineer finds all project work to be complete, the plant material to be in a healthy condition and all landscape areas to be weed-free and in a neat, orderly condition, then written acceptance of work shall be given by the Engineer. When approval and acceptance of the work is not given, the Engineer shall prepare a "construction punch list" of items to be completed before acceptance of the work is given. Acceptance shall only then be given upon verification by the Engineer that the punch list items have been completed. Maintenance period shall only commence after "construction punch list" items have been completed and approved. "Construction punch list" items shall be completed within the specified construction period to avoid liquidated damages and extension of maintenance period.
  - 1. All plant material shall be live, healthy, undamaged, vigorous and free from infestations and animal/pest damage.
  - 2. Planting areas shall be free of all weeds.
  - 3. Nursery stakes shall be removed from trees.

- D. The Contractor's maintenance period will be extended when the provisions required within the plans and specifications are not full complete and accepted by the Engineer.
- E. Watering:
1. All plants shall be kept watered as often as it is necessary to keep them in optimum, vigorous growth. Watering shall be done preferably during the early morning hours.
  2. Water shall be controlled so that there will be no excessive run-off, ponding or overwatering.
  3. Root Growth: Periodically the Contractor shall check the progress of the root growth within the back fill area. As the root growth increases beyond the root ball, the frequency of watering shall be reduced so that the roots are encouraged to grow to a lower soil depth. Watering then shall be less frequent, but applications shall be very slow and the Contractor shall assure that water does penetrate to the depth of the former plant pit.
- F. Spraying:
1. Trees shall be inspected at least two (2) times a month during the growing period to determine the need for spraying to control insect damage, fungus development or any other disease that might be attacking the plants. Plants shall be sprayed with a broad spectrum material that will control the specific pest and any other pests that might normally be anticipated during that part of the season. Preventative spraying shall be done only with the approval of the Engineer.
  2. Operators of spray equipment shall take all reasonable precautions to protect themselves, other people and buildings from spray. The Contractor shall publicly notice the use of herbicides and have all permits and licenses required for such an operation. Where applicable, dormant spray shall be applied to shrubs and trees during the winter period.
  3. All equipment shall be properly washed before and after use. No spraying shall take place without proper public noticing procedures or during windy or gusty days.
- G. Staking and Guying: Stakes and guys shall be inspected a minimum of two (2) times a month to assure that the wires and ties are tight and no damage has occurred to the tree trunk or branches. Contractor shall restake and guy trees as directed by the Landscape Architect.
- H. Weed Control:
1. Weeds shall be kept under control by hand removal. Herbicides shall only be used when approved by the Engineer. Weed all areas at an interval of not more than ten (10) days.
  2. Pre-emergent herbicide shall be applied to all tree and turf areas including plant basins. Chemicals used are to be in written chemical control program prepared by a licensed pest control advisor and approved by the Engineer. Apply prior to any mulching.
  3. All equipment used for herbicides shall be properly cleaned before it is used on this project. Herbicides shall be applied at temperatures recommended by the manufacturers. Herbicides shall not be used during windy or gusty days. All possible precautions shall be taken to protect vegetation which is susceptible to damage from the particular herbicides to be used.
  4. The bases of all plants shall be kept completely free of weeds. Periodically, the base of the trees and shrubs shall be cultivated in order to allow better penetration of water, but such cultivation shall be carefully done in order not to destroy surface roots.
- I. Fertilization: Topdress all areas at one (1) month intervals from time of planting with fertilizer of same composition and at same rate as at time of planting.
- J. Litter: The Contractor shall remove promptly after pruning, trimming and weeding or other work required under the contract, all debris generated by his performance of the work.



Walkways, driveways and paved areas shall be vacuumed clean with suitable equipment immediately after working in these areas. All areas covered by this contract shall be kept free of debris and litter.

- K. Pruning: Prune as necessary to remove injured twigs, branches, dead wood and suckers.

### **3.10 GUARANTEE AND REPLACEMENT**

- A. Guarantee period shall be extended for a period of one (1) year from the date of written acceptance.
- B. All plants shall be guaranteed to be alive and healthy as determined by the Engineer at the end of the guarantee period.
- C. The Contractor shall replace within two (2) weeks of notice and in accordance with the Drawings and Specifications throughout the guarantee period, any plants that die, or in opinion of the Landscape Architect, are in an unhealthy or unsightly condition, and or have lost their natural shape due to dead branches, excessive pruning, inadequate or improper maintenance, or any other causes due to the Contractor's negligence. Any plant that shows 25% defoliation shall be considered unhealthy.

**END OF SECTION**

**SECTION 33 4000**  
**STORM DRAINAGE UTILITIES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Roadway and/or site storm drainage up to 5-feet of any on-site building.
- B. Related Sections include the following:
  - 1. Section 31 2333, Trenching and Backfill.
  - 2. Section 32 1600, Curb, Gutter and Sidewalks.

**1.02 RELATED DOCUMENTS**

- A. Geotechnical Design Recommendations - East Washington Park - Phase 2, Prepared by Miller Pacific Engineering Group, Dated January 10, 2020
- B. Geotechnical Investigation - East Washington Park, Prepared by Miller Pacific Engineering Group, Dated September 30, 2008.
- C. City of Petaluma Design and Construction Standards
- D. City of Petaluma Standard Specifications
- E. AASHTO:
  - 1. M 252: Corrugated Polyethylene Drainage Pipe.
  - 2. M 294: Corrugated Polyethylene Pipe, 12 to 48-inch Diameter.
- F. ASTM:
  - 1. A 74: Cast Iron Soil Pipe and Fittings.
  - 2. A 615/A615M: Deformed and Billet-Steel Bars for Concrete Reinforcement.
  - 3. A 716: Ductile Iron Culvert Pipe
  - 4. A 746: Ductile Iron Gravity Sewer Pipe
  - 5. C 443: Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
  - 6. C 564: Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
  - 7. C 1103: Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
  - 8. C 1173: Flexible Transition Couplings for Underground Piping Systems.
  - 9. D 1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
  - 10. D 2235: Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and fittings.
  - 11. D 2321: Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
  - 12. D 2564: Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
  - 13. D 2751: Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
  - 14. D 3034: Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  - 15. D 4101: Specifications for Propylene Injection and Extrusion Materials.
  - 16. F 477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
  - 17. F 656: Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
  - 18. F 679: Specification for Poly(Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings.

19. F-1336: Poly(Vinyl Chloride) (PVC) Gasket Sewer Fittings.

G. AWWA:

1. C104: Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. C105: Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. C110: Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm) for Water.
4. C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. C150: Thickness design of Ductile Iron Pipe.
6. C151: Ductile-Iron Pipe, Centrifugally Cast, for Water.
7. C153: Ductile-Iron Compact Fittings for Water Service.
8. M41: Ductile Iron Pipe and Fittings.

H. Caltrans Standard Specifications:

1. Section 51, Concrete Structures.
2. Section 52, Reinforcement.
3. Section 65, Reinforced Concrete Pipe.
4. Section 66, Corrugated Metal Pipe.
5. Section 70. Miscellaneous Facilities.
6. Section 72, Slope Protection.
7. Section 75 Miscellaneous Metal.

I. Caltrans Standard Plans:

1. Plan D94A: Metal and Plastic Flared End Sections.
2. Plan D94B: Concrete Flared End Sections.
3. Plan D97A: Corrugated Metal Pipe Coupling Details No.1, Annular Coupling Band Bar and Strap and Angle Connection.
4. Plan D97B: Corrugated Metal Pipe Coupling Details No. 2, Hat Band Coupler and Flange Details.
5. Plan D97C: Corrugated Metal Pipe Coupling Details No. 3, Helical and Universal Couplers.
6. Plan D97D: Corrugated Metal Pipe Coupling Details No. 4, Hugger Coupling Bands.
7. Plan D97E: Corrugated Metal Pipe Coupling Details No. 5, Standard Joint.
8. Plan D97F: Corrugated Metal Pipe Coupling Details No. 6, Positive Joint.
9. Plan D97G: Corrugated Metal Pipe Coupling Details No. 7, Positive Joints and Downdrains.
10. Plan D98A: Slotted Corrugated Steel Pipe Drain Details.
11. Plan D98B: Slotted Corrugated Steel Pipe Drain Details.

### 1.03 DEFINITIONS

- A. AASHTO: American Association of State Highway and Transportation Officials.
- B. ABS: Acrylonitrile-butadiene-styrene.
- C. ASTM: American Society for Testing Materials.
- D. AWWA: American Water Works Association.
- E. CMP: Corrugated metal pipe.
- F. DIP: Ductile iron pipe.
- G. HDPE: High-density polyethylene.
- H. NPS: Nominal pipe size.

- I. PE: Polyethylene.
- J. PVC: Polyvinyl chloride.
- K. RCP: Reinforced concrete pipe.

#### **1.04 SUBMITTALS**

- A. Follow submittal procedure outlined by the Engineer.
- B. Product Data Shop Drawings, Etc.: For the following:
  - 1. Piping materials and fittings.
  - 2. Special pipe couplings.
  - 3. Polymer-concrete, channel drainage systems (trench drains).
  - 4. Joint sealants.
  - 5. Plastic area drains.
  - 6. Cleanout plugs or caps.
  - 7. Precast concrete catch basins, inlets, curb inlets, junction structures and area drains, including frames and grates.
  - 8. Precast clean out boxes and box covers.
  - 9. Concrete, metal and plastic flared end sections.
  - 10. Design Mix Reports and Calculations: For each class of cast in place concrete.
  - 11. Field Test Reports: Indicate and interpret test results for compliance with performance.

#### **1.05 DELIVERY, STORAGE AND HANDLING**

- A. Do not store plastic structures, pipe and fittings in direct sunlight.
- B. Protect pipe, fittings, and seals from dirt and damage.
- C. Handle precast concrete pipe and other precast structures according to manufacturer's written instructions.
- D. Protect imported bedding and backfill material from contamination by other materials.

### **PART 2 PRODUCTS**

#### **2.01 PIPING MATERIALS**

- A. HDPE Pipe and Fittings: 4-inch through 10-inch, AASHTO M 252, Type S, smooth interior and corrugated exterior. Bell and spigot joints.
  - 1. Bell and Spigot Joint Gasket: Elastomeric seal, ASTM F 477.
  - 2. Couplings: AASHTO M 252, corrugated band type. Engage a minimum of 4 corrugations, 2 on each side of pipe joint.
- B. HDPE Pipe and Fittings: 12-inch through 48-inch, AASHTO M 294. Type S, smooth interior and corrugated exterior. Bell and spigot joints.
  - 1. Bell and Spigot Joint Gasket: Elastomeric seal, ASTM F 477.
  - 2. Couplings: AASHTO M 294, corrugated band type. Engage a minimum of 4 corrugations, 2 on each side of pipe joint.
- C. PVC Pipe and Fittings-Smaller than 4-Inch: ASTM D1785, Schedule 40 and Schedule 80 as indicated on plans.
  - 1. Joints: Solvent Cement, ASTM D 2564. Include primer according to ASTM F656.

- D. PVC Pipe and Fittings, 4-Inch and Larger
  - 1. Pipe:
    - a. 4-inch through 15-inch: ASTM D 3034, SDR 35. Bell and spigot joints.
    - b. 18 inch through 36-inch: ASTM F 679, T-1 wall. Bell and spigot joints.
  - 2. Fittings:
    - a. 4-inch through 27-inch: ASTM F 1336.
    - b. 30-inch through 36-inch: ASTM D 3034, SDR 35
  - 3. Joint Gasket: Elastomeric seal, ASTM F 477.

## 2.02 POLYMER-CONCRETE TRENCH DRAINS

- A. General: Modular system of precast, polymer-concrete channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling. Include number of units required to form total length required.
- B. Include the following components:
  - 1. Channel Sections: Interlocking-joint, precast modular units with end caps. Inside width as indicated with deep, rounded bottom, with built in slope or flat invert as indicated and outlets in number, sizes, and locations indicated. Include extension sections necessary for required depth.
  - 2. Frame and Grate: Gray iron, ductile iron or galvanized steel as indicated. Where drain is located in traffic areas, rate for AASHTO H20 loading.
- C. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
  - 1. "ACO Drain" by ACO Polymer Products Inc. , or approved equal

## 2.03 PIPE ANCHORS

- A. Portland Cement Concrete and Reinforcing: Section 321600.=

## 2.04 SPECIAL PIPE COUPLINGS

- A. Plastic, Cast Iron and Ductile Iron Pipe: ASTM C 1173. Rubber or elastomeric sleeve and stainless steel band assembly fabricated to match outside diameters of pipes to be joined.
- B. Reinforced Concrete Pipe: Portland cement collar as indicated.

## 2.05 CLEANOUTS

- A. Piping: Same as storm drain line if possible.
- B. Top Plug or Cap: Same material as piping if possible. Plug or cap to be secure but removable, threaded or non-threaded.
- C. Box Size: As required to provide access and allow easy removal and reinstallation of plug or cap.
- D. Box Types:
  - 1. Non-Traffic Areas: Portland cement concrete box and box cover, light duty.

2. Traffic Areas: Portland cement concrete box and box cover or steel or cast iron cover, heavy duty, both box and cover to be rated for AASHTO H20 loading.
- E. Box Cover Markings: "S.D.," unless otherwise specified.
- F. Available Manufacturers: Subject to compliance with requirements, box manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
  1. Associated Concrete Products, Inc. (Santa Ana, California) (Tel. 714-557-7470).
  2. Brooks Products Inc. (El Monte, California) (Tel. 818-443-3017).
  3. Christy Concrete Products, Inc. (Fremont, California) (Tel. 800-486-7070).

## **2.06 CURB INLETS, CATCH BASINS, DROP INLETS, JUNCTION STRUCTURES, AREA DRAINS, ETC.**

- A. General: Size, shape, configuration, depth, etc. of structure and frame, grate, or cover shall be as indicated.
- B. Portland Cement Concrete and Reinforcing: Section 321600.
- C. Precast Structure: Rate for AASHTO H20 loading in traffic areas.
- D. Steps: ASTM C 478 or AASHTO M 199. Manufacture from deformed, ½-inch steel reinforcement rod complying with ASTM A 615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Acceptable manufacturer is Hanson Concrete Products, (Milpitas, CA) (Tel 408-262-1091).
- E. Frames, Grates and Covers: Caltrans Standard Specification Section 75-1.02, 75-1.03 and 75-1.05.
  1. Galvanize steel frames, grates and covers.
  2. Grates and covers shall be non-rocking.
  3. Rate for AASHTO H20 loading in traffic areas.

## **2.07 JOINT SEALANT FOR PRECAST STRUCTURES**

- A. Mortar: Caltrans Standard Specification Section 51-1.135.
  1. Use to seal around pipes at connections to structures and manholes. Also use to seal joints between precast sections of structures and manholes.
- B. Gaskets: Preformed flexible rubber or plastic gasket.
  1. Rubber Gaskets: ASTM C 443.
  2. Plastic Gaskets: Federal Specification SS-S-00210 (GSA-FSS), Type I, Rope Form; or alternate standard which may exist. Acceptable material is "Ram-Nek" as manufactured by the K. T. Snyder Company (Houston TX) or equal.

## **PART 3 EXECUTION**

### **3.01 PIPE INSTALLATION**

- A. General: Install pipe, fittings, and appurtenances utilizing best practices, manufacturer's instructions, and in accordance with Section 6 and 7 of ASTM D 2321 for plastic pipe, Caltrans Standard Specification Section 65-1.07 for reinforced concrete pipe, Caltrans Standard Specification Sections 66-1.045 and 66-1.05 for corrugated metal pipe and chapter 11.3.3 of AWWA M41 for cast iron and ductile iron pipe.
- B. Pipe Depth and Trench Configuration: Conform to typical trench section(s) indicated.

- C. Excavation, Bedding, Backfill, and Compaction: Section 312333.
- D. Handling: Carefully handle during loading, hauling, unloading and placing operations to avoid breakage or damage. Use strap type slings for lifting and placing; no chains or hooks will be permitted. Comply with manufacturer's recommendations.
- E. Laying: Before lowering pipe into the trench, remove all stakes, debris, loose rock and other hard materials from the bottom of the trench. Lay accurately in conformance with lines and grades indicated. Start laying the pipeline at the low end and proceed upstream. Lay bell and spigot pipe with the bell end facing upstream. Lay pipe on a bed prepared by handwork, dug true to grade. Furnish firm bearing for pipe throughout its entire length with bell holes provided at the ends of each pipe length of sufficient size to permit making up the particular type of joint being used. Adjust pipe to line and grade by scraping away or filling and tamping material under the body of the pipe for the entire pipe length and not by blocking or wedging. After final positioning, hold pipe in place in trench with backfill material placed equally on both sides of the pipe at as many locations as required to hold the pipe section in place.
- F. Curved Alignment: When necessary to conform to the alignment specifically indicated, lay pipe on a curved alignment by means of asymmetrical closure of joints or bending of the pipe barrel. Use shorter lengths of pipe than the standard length if necessary to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.
- G. Closure: Close open ends of pipes and appurtenance openings at the end of each days work or when work is not in progress.

### **3.02 INSTALLATION OF PIPE ANCHORS**

- A. Install at location, configuration and details shown on the Plans.

### **3.03 SPECIAL PIPE COUPLINGS**

- A. General: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
- B. Installation: Manufacturer's instructions.

### **3.04 CLEANOUT INSTALLATION**

- A. General: Install as indicated.

### **3.05 INSTALLATION OF CURB INLETS, CATCH BASINS, DROP INLETS, JUNCTION STRUCTURES, AREA DRAINS, ETC.**

- A. Excavation, Bedding, Backfill, and Compaction: Section 312333.
- B. Poured in Place Structures: Install as indicated and Caltrans Standard Specification Section 51.
  - 1. Shape bottoms to convey flows as indicated.
- C. Precast Structures: Install as indicated.
  - 1. Seal all joints and pipe entrances and exits.
  - 2. Place concrete in bottom and shape to convey flows as indicated.

### 3.06 POLYMER-CONCRETE TRENCH DRAIN INSTALLATION

- A. Excavation, Bedding, Backfill, and Compaction: Section 312333.
- B. Install: As indicated and in accordance with the manufacturer's instructions.

### 3.07 TESTING

- A. General: Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
  - 1. Do not enclose, cover, or put into service before inspection and approval.
  - 2. Test completed piping systems according to authorities having jurisdiction.
  - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.
  - 4. Submit separate reports for each test.
  - 5. Where authorities having jurisdiction do not have published procedures, perform tests in accordance with latest edition of the Uniform Plumbing Code (UPC) Section 1109.0, Testing.
  - 6. Leaks and loss in test pressure constitute defects that must be repaired.
  - 7. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.
- B. Reinforced Concrete Pipe:
  - 1. Reinforced concrete pipe, sizes 27-inch and larger, shall be hydrostatically joint tested, (air test is not to be used), in the field for water-tightness in accordance with ASTM Standard C 1103.
  - 2. Perform test after pipe is bedded but prior to any backfill.
  - 3. Testing may be done by manufacturing pipe with double gasket joints, or by utilizing a joint tester. Contractor shall obtain the Engineer's approval of details of the Contractor's selected method prior to performing the testing.
  - 4. Inspect all joints for leakage.
  - 5. If the pressure holds, or drops less than 1psi in 5 seconds, the joint is acceptable.

### 3.08 TELEVISION INSPECTION

- A. After completion of the pipe installation, service connections, flushing and cleaning, and prior to placement of pavement, the drain line shall be televised with a color closed-circuit television with tilt-head camera recorded in DVD format. The original disc and log sheets shall be provided to the City of Petaluma Public Works Department for review.
- B. The following observations from television inspections will be considered defects in the construction of sewer pipelines and will require correction prior to placement of pavement:
  - 1. Low spot (1 inch or greater - mainlines only)
  - 2. Joint separations (3/4 inch or greater opening between pipe sections)
  - 3. Cocked joints present in straight runs or on the wrong side of pipe curves.
  - 4. Chips in pipe ends
  - 5. Cracked or damaged pipe
  - 6. Dropped joints
  - 7. Infiltration
  - 8. Debris or other foreign objects
  - 9. Other obvious deficiencies



10. Irregular condition without logical explanation

**END OF SECTION**

**APPENDIX 1**  
**Geotechnical Investigation Report**



January 10, 2020  
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GSM Landscape Architects Inc.  
1700 Soscol Ave., Suite 23  
Napa, California 94559  
Attn: Mr. Bart Ito

Re: Geotechnical Design Recommendations  
East Washington Park – Phase 2  
Petaluma, California

### Introduction & Project Description

We are pleased to present our geotechnical recommendations for the planned synthetic turf play field as part of the East Washington Park – Phase 2 project located in Petaluma, California. The project location is shown on Site Map, Figure 1. We understand the improvements include constructing a new synthetic turf baseball field on currently undeveloped land adjacent to a recently completed synthetic turf soccer field. Additionally, the project includes constructing a new restroom/concession structure, paved pedestrian paths, asphalt parking areas, landscaped areas, and site utilities.

Our work was performed in accordance with our Agreement dated July 1, 2016. We previously performed a Geotechnical Investigation for the entirety of the park project dated September 30, 2008. The scope and purpose of our services includes updating our recommendations in this letter report to aid in the design and construction of the project.

### Existing Conditions

The proposed project site is undeveloped and covered in low grasses. As shown on Figure 2, the completed Phase 1 portion of the project, consisting of three synthetic turf soccer fields, is located to the immediate east. Additional undeveloped land to the west will be developed in the future as part of Phase 3 of the East Washington Park project.

### Field Exploration and Laboratory Testing

As previously discussed, we provided a Geotechnical Investigation Report, dated September 30, 2008, that included a subsurface exploration in the general vicinity of the proposed improvements. Our previous exploration included 11-borings drilled with track mounted equipment to depths between 4.5 to 15.0-feet on July 30, 2008. The boring locations are shown on Figure 2. The soils encountered in our borings were logged and samples were obtained for laboratory testing. The subsurface exploration program is discussed in more detail in Appendix A along with a Soil Classification Chart on Figure A-1. The boring logs are presented on Figures A-2 through A-12 of Appendix A.

Laboratory testing of samples from the exploratory borings included moisture content, dry density, unconfined compression, and plasticity index testing. The results of the moisture content, dry density, and unconfined compression tests are presented on the boring logs and

the plasticity index test results are presented on Figure A-13. The laboratory testing program also is discussed in more detail in Appendix A.

### Subsurface Conditions

The soils within the project site generally consist of high plasticity, silty clay (Adobe Clay) to depths of 3.0- to 9.0-feet below the ground surface, underlain by stiff, low to medium plasticity silty and sandy clay. Lenses of silty and clayey sand were encountered in Boring 3. Our past experience, as well as current site observation and laboratory testing, indicate that the Adobe clay is moderately to highly expansive (will undergo large volume changes with seasonal changes in moisture content).

Groundwater was not observed in any of the borings we excavated. However, our borings were not left open for an extended period of time to allow groundwater levels to equalize. Therefore, the groundwater elevations observed may not reflect actual levels. Typically, groundwater levels fluctuate seasonally with higher levels anticipated during the winter/rainy season.

### Discussion and Recommendations

Based on our experience with similar projects, it is our opinion that construction of a new synthetic turf playfield is feasible from a geotechnical engineering standpoint. The primary geotechnical issues at the project site are site grading, expansive soils, providing a firm and uniform subgrade for the proposed field, and design of an adequate drainage system under the field.

### Site Grading

We anticipate moderate site grading will be required for the proposed improvements. Site preparation and grading should conform to the following recommendations and criteria:

1. Surface Preparation – Clear all vegetation and over-sized debris from areas that will be within the new project work area. Excavate loose soil to expose firm natural soils. Any landscaping vegetation within the field areas should be scraped from the surface, stockpiled for reuse in landscaping, or removed from the site. Any construction debris or abandoned utilities encountered during site grading should be removed from the site. Utilities could also be abandoned in place, in many cases, provided cement grout completely fills any void in the utility. Rocks or concrete pieces larger than 6 inches encountered during subgrade preparation or site grading should be removed from the site.
2. Materials – In structural areas (i.e., pavement areas, structures, etc.) the underlying expansive soils and rock mixtures generated from on-site excavations are not suitable for use as fill, unless lime treated. If imported fill is required, the material shall consist of soil and rock mixtures that: (1) are free of organic material, (2) have a Liquid Limit less than 40 and a Plasticity Index of less than 20, and (3) have a maximum particle size of 4 inches. Any imported fill material shall be tested to determine its suitability for use as fill material.
3. Compacted Fill –Subgrade surface should be scarified to a depth of 8 inches, moisture conditioned to near optimum moisture content and compacted to a minimum of 90% relative compaction. In landscape areas, the relative compaction may be reduced to 85%. The maximum

laboratory dry density and optimum moisture content of fill materials should be determined in accordance with ASTM Test Method D-1557, "Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using a 10-lb. Rammer and 18-in. Drop."

New fill or backfill should be conditioned to a moisture content within 3% of the optimum moisture content. Properly moisture conditioned and cured on-site materials should be placed in loose horizontal lifts of 8 inches thick or less, and uniformly compacted to at least 90% relative compaction. In areas of new asphalt pavement, the upper 8-inches should be further compacted to 95% relative compaction to provide a firm and unyielding surface under heavy construction equipment.

4. Soil Treatment – As previously discussed, the site is blanketed with high plasticity, highly expansive, clayey soils. These soils will change in volume with fluctuations in moisture content; expanding/swelling when wet and shrinking when dry. Expansive soils are capable of exerting significant expansion pressures on building foundations, interior floor slabs and exterior flatwork. Distress from expansive soil movement can include cracking of brittle wall coverings (stucco, plaster, drywall, etc.), racked door and/or window frames, and uneven floors and cracked slabs. Flatwork, pavements, and concrete slabs-on-grade are particularly vulnerable to distress due to their low bearing pressures. Additionally, expansive soils will result in an uneven playing surface on the synthetic turf fields.

Based on our experience with similar projects, to mitigate the expansive potential of the surficial highly expansive clay these soils should be treated with high calcium lime. The high calcium lime chemically reacts with the highly expansive clay effectively removing its expansive potential and significantly lowering its plasticity. Based on the plasticity index of the surficial clay we recommend introducing at least 6% high calcium lime by soil weight (110 pcf) in the upper 18-inches of soil underlying, and 5-feet beyond, the synthetic turf and flatwork. The treatment depth should be increased to 36-inches in areas where structures will be placed (i.e. restroom/concession building). The lime treatment shall be placed in a manner conforming to the most recent Caltrans Standard Specification. The percentage of lime added should be verified prior to construction via laboratory optimum lime percentage testing.

#### Synthetic Turf G-Max

The hardness of a field is measured by its G-Max value. This value is a measure of the g-forces (g) absorbed in a 20-pound object falling 24-inches onto a playing surface. A G-Max value of 200 g is considered the maximum safety threshold for a playing surface. An industry standard G-Max range for a safe playing surface is between 120 to 180 g. The g-max value is influenced by the infill type and the drainage layer.

#### Synthetic Turf Infill

Synthetic turf has been historically been infilled with crumb rubber or a combination of sand and crumb rubber. Recently, the infill trend is shifting from crumb rubber and moving to cork and/or coconut fiber. Crumb rubber infill tends to produce fields that have G-Max values within the safety guidelines, between 120 and 180. However, cork and/or coconut fiber infilled fields tend to produce higher G-Max values and usually require a shock pad underlying the turf to produce acceptable G-Max values. As with all synthetic turf playing surfaces, G-Max values tend to

increase with age and routine maintenance and testing is recommended to prolong the design life within the safety standards.

### Synthetic Turf Drainage

For preliminary design, we recommend that the surface of the field be designed with a 0.5% to 1.0% slope. A permeable layer (drainrock, drainage panels, etc.) underlie the synthetic turf to carry water laterally to collector drains, typically located at the field perimeters. If a permeable stone system, as described below, is utilized the subgrade should be graded to a minimum slope of 1.0%.

Permeable Base Options – There are three drainage options for the synthetic turf permeable base. The first option is a single stone permeable system with drainage panels, the second is a two stone (bottom and top rock) permeable system, and the third is a Brock (or similar) continuous panel drain system. Each option is discussed in more detail below:

*Single Stone Permeable Base* – The single stone permeable section consists of placing a layer of permeable well graded rock on the subgrade over flat drainage panels configured in a “herringbone” pattern. A stabilization fabric (such as Mirafi FW500) should be placed over the subgrade prior to the placement of the rock. The permeable rock will transmit collected rain water to the flat panel drains. The flat panel drains will then transmit the water to a perimeter collector drain that connects to the City Storm Water system. The advantage of this system is fewer materials are used in the permeable base requiring less grading time. However, the single stone permeable system has less water storage capacity and slower drainage than the two-stone system. Depending on the finished grades, excavation may be required to achieve the planned subgrade.

*Two-Stone Permeable Base* – The two-stone permeable rock system is constructed similar to the one-rock system. The difference is the section consists of a layer of larger, highly permeable “Bottom Rock” and a thin finer graded “Top Rock” to facilitate a smooth finished surface for the placement of the synthetic turf. The bottom rock provides more pore space for water to quickly transfer water to the storm drain collection system. “Top Rock”, is placed on the bottom rock to act as a leveling coarse and reduces the potential of larger gravels “poking” into the synthetic turf causing bumps in the surface. The two-stone system can be designed using either flat panel drains or conventional trench type drains. The advantage of the two-rock system is that the rock section has a higher storage and flow rate capacity compared to the other options. However, the two rock system may cost more in time (grading two layers) and materials than the one rock system. Depending on the finished grades, excavation may be required to achieve the planned subgrade.

*Drainage Panels* – Drainage panels such as Brock™ may be utilized in lieu of a permeable rock system. Brock panels are inter-locking Styrofoam panels that are perforated to allow vertical drainage. The bottom of a Brock Panel contains grooves that allow water to be transmitted to the storm drain system. Due to the inherent high permeability of the drainage panels, the subgrade slope may be reduced to 0.5%. To reduce erosion of the subgrade, a layer of Caltrans Class 2 Aggregate Baserock and stabilization fabric should be placed on the subgrade prior to placing the Brock panels. The advantage of the Brock panels is a reduced section thickness (i.e. less excavation) and a softer field with a lower G-Max value. However, the Brock

system is usually more costly and is expected to have a shorter design life (20-years).

### Seismic Design

The project site is located in a seismically active area. Therefore, structures should be designed in conformance to the seismic provisions of the California Building Code (CBC). However, since the goal of the building code is protection of life safety, some structural damage may still occur during strong ground shaking.

Based on the results of our subsurface exploration and laboratory testing we judge the site should be classified as "Site Class D" per ASCE 7-16. The ASCE 7-16 mapped spectral acceleration parameters at a period of 0.2-second,  $S_S$ , and 1.0-second,  $S_1$ , at the project site are 1.86 g and 0.71 g, respectively. Per ASCE 7-16 Table 11.4-1 a Site-Specific Ground Motion shall be developed per ASCE 7-16 Section 11.4.8 for  $S_S$  values greater than 1.0 g for Site Class E sites and all cases for Site Class F sites. Additionally, a Site-Specific Ground Motion Hazard Analysis shall be performed per ASCE 7-16 Section 11.4.8 if the  $S_1$  value is greater than 0.2 g for Site Class D, greater than 1.0 g for Site Class E, and all cases for Site Class F. Therefore, per ASCE 7-16 Section 11.4.8, we performed a Site-Specific Ground Motion Hazard Analysis per ASCE 7-16 Section 21.2, as described in the sections below.

*Probabilistic (MCE) Ground Motions: Method 1* – A probabilistic acceleration response spectrum, corresponding to a 2% chance of exceedance in 50-years (2,475 return period) was generated utilizing the United States Geologic Survey (USGS) online Unified Hazard Tool (<https://earthquake.usgs.gov/hazards/interactive/>, accessed 2019) for a Site Class D soil profile ( $V_{S30} = 270$  m/s) and the Dynamic: Conterminous U.S. 2014 (v4.2.1) model. The accelerations given were modified by the risk coefficients  $C_{RS}$  and  $C_{R1}$ , 0.90 and 0.89, respectively. The accelerations were further converted to the probabilistic spectral response acceleration in the maximum horizontal response utilizing the procedures outlined by ASCE 7-16 Section 21.2. These modifications to the probabilistic spectra correspond to a response with a risk targeted level of 1% probability of collapse within a 50-year period. The resulting probabilistic MCE values and spectra are presented on Figures 3 and 4, respectively.

*Deterministic (MCE<sub>R</sub>) Ground Motions* – A deterministic acceleration response spectrum was generated utilizing the NGA attenuation models outlined by Abrahamson, Silva & Kamai (2014); Boore, Stewart, Seyhan & Atkinson (2014); Campbell & Borzognia (2014); and Chiou & Youngs (2014) NGA2 West models for a Site Class D ( $V_{S30} = 270$  m/s). The geometric average of the 84<sup>th</sup> percentile spectral accelerations from the aforementioned attenuation relationships were modified for the maximum horizontal direction, utilizing the procedures outlined by ASCE 7-16 Section 21.2. The resulting deterministic MCE values and spectra are shown on Figures 3 and 4, respectively. The maximum value of the Deterministic MCE shall not be less than the scaled deterministic spectra with a maximum value of  $1.5 \times F_a = 1.5$  g, as described in ASCE 7-16 Section 21.2.

*Site Specific MCE<sub>R</sub>* – The site specific MCE<sub>R</sub> spectral response acceleration at any period shall be taken as the lesser of the response accelerations from the probabilistic ground motions and the deterministic ground motions and is presented on Figure 4. Additionally, per ASCE 7-16 Section 21.3, the design spectral response acceleration at any period is equal to  $2/3^{rds}$  the MCE<sub>R</sub> Response Spectrum, but not less than 80% of the modified General Response

Spectrum, as shown on Figure 5.

Per ASCE 7-16 Section 21.4, the  $MCE_R$  spectral response acceleration parameters shall be taken from the Site-Specific Spectrum defined as follows and are presented on Figure 5 and summarized on Table A:

- $S_{DS}$  – The  $S_{DS}$  parameter shall be taken as 90% of the maximum spectral acceleration,  $S_a$ , obtained from the site-specific spectrum, at any period between 0.2 and 5.0-seconds. However, the values obtained shall not be less than 80% of the values determined in accordance with ASCE 7-16 Section 11.4.5.
- $S_{D1}$  – The  $S_{D1}$  parameter shall be taken as the maximum value of the product,  $TS_a$ , for periods between 1.0 and 2.0-seconds for Site Class C and B sites; and periods between 1.0 and 5.0-seconds for Site Class D, E & F sites. However, the values obtained shall not be less than 80% of the values determined in accordance with ASCE 7-16 Section 11.4.5.
- $S_{MS}$  – The  $S_{MS}$  parameter is equal to 1.5 times the  $S_{DS}$  value, but not less than 80% of the values determined in accordance with ASCE 7-16 Section 11.4.4.
- $S_{M1}$  – The  $S_{M1}$  parameter is equal to 1.5 times the  $S_{D1}$  value, but not less than 80% of the values determined in accordance with ASCE 7-16 Section 11.4.4.

---

TABLE A  
ASCE 7-16 SEISMIC PARAMETERS  
East Washington Park – Phase 2  
Petaluma, California

<u>Factor Name</u>	<u>Coefficient</u>	<u>ASCE 7-16 Site Specific Value</u>
Site Class <sup>1</sup>	$S_{A,B,C,D,E, \text{ or } F}$	$S_D$
Spectral Acc. (short)	$S_S$	1.86 g
Spectral Acc. (1-sec)	$S_1$	0.71 g
Spectral Response (short)	$SM_S$	1.70 g
Spectral Response (1-sec)	$SM_1$	1.55 g
Design Spectral Response (short)	$SD_S$	1.13 g
Design Spectral Response (1-sec)	$SD_1$	1.03 g
$MCE_G^2$ PGA adjusted for Site Class	$PGA_M$	0.86 g

Notes:

1. Site Class D Description: Stiff soil profile with shear wave velocities between 600 and 1,200 ft/sec, standard blow counts between 15 and 50 blows per foot, and undrained shear strength between 1,000 and 2,000 psf.
  2. Maximum Considered Earthquake Geometric Mean.
-



Foundation Design

We understand the proposed restroom/concession structure will consist of relatively heavy concrete masonry unit (CMU) construction with concrete slab on grade floors. Provided the soils are lime treated, the restroom/concession structure may be supported on a shallow foundation system. Localized deepening of foundation excavations or over-excavation and re-compaction may be required if looser materials are encountered in the foundation excavations. Additionally, ancillary improvements (i.e. fencing, light posts etc.) will be supported on a drilled pier foundation system. Shallow and deep foundation design criteria are presented in Table B below.

---

TABLE B  
FOUNDATION DESIGN CRITERIA  
East Washington Park – Phase 2  
Petaluma, California

Shallow Foundations

Minimum footing width <sup>1</sup> :	12 inches
Minimum footing embedment depth (below lowest adjacent grade):	18 inches
Allowable soil bearing pressure (lime treated):	
Dead plus live loads:	2,500 psf
Total design loads (includes wind or seismic):	3,300 psf
Base friction coefficient:	0.30
Lateral passive resistance <sup>2, 3, 4</sup> :	300 pcf

Drilled Piers

Minimum diameter:	18 inches
Minimum Depth:	5 feet
Skin Friction (dead plus live loads) <sup>4,5,6</sup> :	500 psf
Lateral passive resistance <sup>2,7,8</sup> :	300 pcf

Notes:

- 1.) Size footing widths to avoid significantly different foundation pressures.
  - 2.) Equivalent Fluid Pressure, not to exceed 3,000 psf.
  - 3.) Ignore uppermost 6-inches unless concrete or asphalt surfacing exists adjacent to foundation.
  - 4.) May increase design values by 1/3 for total design loads including seismic.
  - 5.) Uplift resistance is equal to 80% the vertical resistance.
  - 6.) Neglect the upper 3-feet for natural soil and 1-foot for lime treated soils, unless concrete or asphalt surfacing exists adjacent to foundation.
  - 7.) Apply values over effective width of two pier diameters.
  - 8.) Equivalent fluid pressure.
-

Retaining Wall Design

We understand retaining walls up to 4-feet in height will be constructed. These walls may be supported on shallow foundations as described above. Walls free to rotate at the top, (i.e. “unrestrained”) and walls structurally connected at the top (i.e. “restrained”), should be designed using the design criteria shown in Table C below.

---

TABLE C  
RETAINING WALL DESIGN CRITERIA  
East Washington Park – Phase 2  
Petaluma, California

<u>Foundations</u>	
See Table E	
<u>Unrestrained Earth Pressure</u> <sup>1</sup>	40 pcf
<u>Restrained Earth Pressure</u> <sup>1</sup>	60 pcf
<u>Surcharge Loading</u> <sup>2,3</sup>	100 psf
<u>Seismic Surcharge</u> <sup>4,5</sup>	10 x H psf

Notes:

- 1) Equivalent fluid pressure.
- 2) Apply to the upper 3-feet. Rectangular distribution.
- 3) Surcharge loading not required if retaining walls are backfilled with lime treated or other non-expansive soils.
- 4) Rectangular distribution. The factor of safety for short-term seismic conditions can be reduced to 1.0 or greater.
- 5) Seismic surcharge loading is not required for retaining walls less than 6-feet in height.

---

Drainage shall be provided for all retaining walls taller than two feet. Either Caltrans Class 1B permeable material within filter fabric or Caltrans Class 2 permeable material can be used. The seepage should be collected in a 4-inch perforated PVC drain line at the base of the wall. The permeable material shall extend at least 12 inches from the back of the wall and be continuous from the bottom of the wall to within 12 inches of the ground surface. Alternatively, drainage panels, such as Mirifi 100N, may be utilized. Additionally, waterproofing should be constructed behind retaining walls that abut interior space. The Project Architect and/or waterproofing expert should design the waterproofing system.

Seepage collected in the drain line should be conveyed off-site by gravity in closed pipe to the storm drainage system. The pipe shall have a minimum slope of one percent to drain. To maintain the wall drainage system, clean outs shall be installed at the upstream end and at all

major changes in direction. Water proofing of any below grade residential walls should be designed by the Architect to prevent moisture infiltration through the wall into living spaces.

### Concrete Slab-on-Grade

If interior concrete slabs are planned, we recommend they be at least 5-inches thick and reinforced with steel bars (not wire mesh). Contraction joints should be incorporated in the concrete slab in both directions, no greater than 10-feet on center. Additionally, the reinforcing bars shall extend through the control joints. For improved performance, concrete slabs-on-grade may be increased to 6-inches thick. The project Structural Engineer should design the concrete slab floors.

To improve interior moisture conditions, a minimum 5-inch layer of clean, free draining, 3/4-inch angular gravel or crushed base rock should be placed beneath the interior concrete slabs to form a capillary moisture break. The base rock must be placed on a properly moisture conditioned and compacted subgrade that has been approved by the Geotechnical Engineer. A plastic membrane vapor barrier, 15-mil or thicker, should be placed over the drain rock. The vapor barrier shall meet the Class A requirements outlined in ASTM E 1745 and be installed per ASTM 1643. Eliminating the capillary moisture break and/or plastic vapor barrier may result in excess moisture intrusion through the floor slabs resulting in poor performance of floor coverings, mold growth or other adverse conditions.

Exterior concrete slabs should be at least 4-inches thick and reinforced as described above for interior slabs. For improved performance, exterior concrete slabs shall be underlain with at least 4-inches or more of Caltrans Class 2 Aggregate Base compacted to at least 92 percent relative compaction. Some movement should be expected for exterior concrete slabs as the underlying soils react to seasonal moisture changes and downslope soil creep.

### Site Utilities

Excavations for utilities will encounter hard packed lime treated soil and stiff clayey soil. Trench excavations having a depth of five feet or more and will be entered by workers must be sloped, braced, or shored in accordance with current Cal/OSHA regulations. On-site soils appear to be Type B. All excavations where collapse of excavation sidewall, slope or bottom could result in injury or death of workers should be evaluated by the contractor's safety officer and designated competent person prior to entering in accordance with current Cal/OSHA regulations.

Bedding materials for utility pipes should be well graded sand with 90 to 100 percent of particles passing the No. 4 sieve and no more than 5 percent finer than the No. 200 sieve. Provide the minimum bedding beneath the pipe in accordance with the manufacturer's recommendation, typically 3 to 6 inches. Trench backfill may consist of on-site soils moisture conditioned to at least 2 percent over the optimum moisture content, placed in thin lifts and compacted to at least 90 percent R.C. Backfill for trenches within pavement areas should consist of non-expansive granular fill. Use equipment and methods that are suitable for work in confined areas without damaging utility conduits. Where utility lines cross under or through perimeter footings, they should be sealed to reduce moisture intrusion into the areas under the slabs and/or footings.

Pavement Structural Sections

Typically, asphalt pavement sections are designed utilizing two variables, the R-Value (a measure of the subgrade resistance) and the Traffic Index (TI – a measure of the amount of daily traffic). Based on our experience with similar projects, lime treatment will significantly increase the R-Value of a soil. Therefore, for design purposes we utilized an R-Value of 40, for lime treated subgrade, to calculate asphalt pavement sections. We have calculated various pavement sections for the project site and anticipated soil conditions in accordance with Caltrans procedures for flexible pavement design utilizing multiple TI values as shown in Table D.

---

TABLE D  
ASPHALT PAVEMENT SECTIONS  
East Washington Park  
Petaluma, California

<u>T.I.</u>	<u>Asphalt Concrete</u>	<u>Aggregate Baserock</u>
4.0	2.5-inches	6.0-inches
5.0	3.0-inches	6.0-inches
6.0	3.5-inches	6.0-inches

Note:

- 1.) Assumes subgrade has been lime treated.
- 2.) To reduce the overall section thickness the “2 to 1” rule of thumb may be applied, where 2-inches of AB is equivalent to 1-inch of AC. For example a section consisting of 4.0-inches of AC overlying 15.5-inches of AB (19.5-inches total) may be reduced to 6.0-inches of AC overlying 11.5-inches of AB (17.5-inches total).

---

Prior to construction of the new pavement section, the existing subgrade should be scarified to a minimum depth of 8-inches, moisture-conditioned to near-optimum moisture content. The subgrade should then be compacted to a minimum of 95 percent relative compaction per ASTM D-1557 and to produce a firm and unyielding surface when proof rolled with heavy construction equipment.

The aggregate baserock should conform to requirements for Caltrans Class 2 Aggregate Base as presented in Section 26 of the latest edition of the Caltrans Standard Specifications (2015). The baserock should be placed in 6-inch maximum lifts on a properly prepared, firm and unyielding subgrade and compacted to at least 95 percent relative compaction. Additionally, the compacted aggregate baserock section should be firm and unyielding under heavy construction equipment.

Asphalt concrete should conform to Caltrans  $\frac{3}{4}$ -inch maximum, medium Type A specifications, should contain no less than 4.5 percent asphalt, and should be placed in accordance with the procedures outlines in Section 39 of the latest edition (2015) of the Caltrans Standard Specifications. Additionally, the top lift of asphalt should consist of  $\frac{1}{2}$ -inch maximum aggregate. Asphalt concrete should be compacted in lifts not exceeding 2-inches in thickness to a minimum of 92 percent of the theoretical maximum density.

Additional Services

We are prepared to begin design of the synthetic turf field once the field drainage system and the existing or proposed storm drainage system are known. During construction, we should be present to observe foundation excavations and confirm that the subsurface conditions, materials, and work are as expected and are consistent with our recommendations.

We hope this provides you with the information you require at this time. Please do not hesitate to call with any questions or if we can be of further assistance.

Sincerely,  
MILLER PACIFIC ENGINEERING GROUP



Benjamin S. Pappas  
Geotechnical Engineer No. 2786  
(Expires 9/30/18)

Attachments: Figures 1 through 5  
Appendix A



Latitude: 38.2642  
 Longitude: -122.6079

# SITE LOCATION MAP

(Not to Scale)



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 F 415 / 382-3450  
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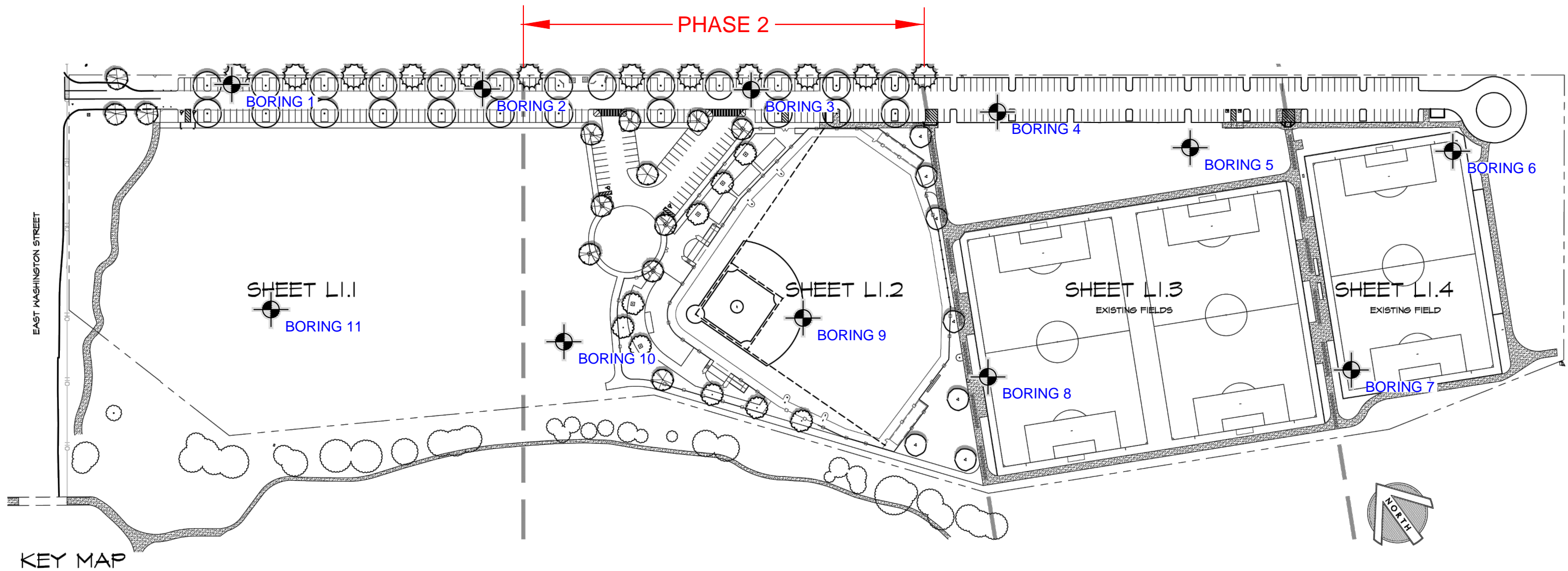
## SITE LOCATION MAP


GSM - East Washington Park  
 Phase 2 Improvements  
 Petaluma, California

Project No. 1477.072 Date: 10/26/17

Drawn BSP  
 Checked

**1**  
 FIGURE



 - Boring performed by MPEG 2008

SCALE  
0 25 150 300 feet

**MPEG**  
 **MILLER PACIFIC**  
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<b>SITE PLAN</b>		<b>2</b> FIGURE
GSM - East Washington Park Phase 2 Improvements Petaluma, California Project No. 1477.072      Date: 10/26/17		
Drawn	BSP	
Checked		

## **APPENDIX A**

### **SUBSURFACE EXPLORATION AND LABORATORY TESTING**

#### **1.0 Subsurface Exploration**

We explored subsurface conditions at the site by drilling eleven test borings on July 30, 2008 at the locations shown on Figure 2. Test borings were drilled to maximum depths of 4.5 to 15 feet using 6-inch diameter continuous flight solid augers mounted on an all-terrain drill rig.

The soils encountered were logged and identified by our field geologist in general accordance with ASTM Standard D 2487, "Field Identification and Description of Soils (Visual-Manual Procedure)." This standard is briefly explained on Figure A-1, Soil Classification Chart and Key to Log Symbols. The boring logs are presented on Figures A-2 through A-12.

We obtained "undisturbed" samples from our borings using a 3-inch diameter, split-barrel modified California sampler with 2.5 by 6-inch brass tube liners, and disturbed samples using a 2-inch diameter Standard Penetration Test sampler and no liners. The sampler was driven with a 140-pound hammer falling 30 inches. The number of blows required to drive the samplers 18 inches was recorded and is reported on the boring logs as blows per foot for the last 12 inches of driving. The samples obtained were examined in the field, sealed to prevent moisture loss, and transported to our laboratory.

#### **2.0 Laboratory Testing**

We conducted laboratory tests on selected intact samples to verify field identifications and to evaluate engineering properties. The following laboratory tests were conducted in accordance with the ASTM standard test method cited:

- Laboratory Determination of Water (Moisture Content) of Soil, Rock, and Soil-Aggregate Mixtures, ASTM D 2216;
- Density of Soil in Place by the Drive-Cylinder Method, ASTM D 2937;
- Atterberg Limits (Plasticity), ASTM D 4318; and,
- Unconfined Compressive Strength of Cohesive Soil, ASTM D 2166.

The moisture content, dry density, unconfined compression, and Atterberg Limits test results are shown on the exploratory Boring Logs. The Atterberg Limits tests are summarized on Figure A-13.

The exploratory boring logs, description of soils encountered and the laboratory test data reflect conditions only at the location of the boring at the time they were excavated or retrieved. Conditions may differ at other locations and may change with the passage of time due to a variety of causes including natural weathering, climate and changes in surface and subsurface drainage.



MAJOR DIVISIONS		SYMBOL	DESCRIPTION
COARSE GRAINED SOILS over 50% sand and gravel	CLEAN GRAVEL	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
	GRAVEL with fines	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	CLEAN SAND	SW	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
	SAND with fines	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS over 50% silt and clay	SILT AND CLAY liquid limit <50%	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	SILT AND CLAY liquid limit >50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS	PT	Peat, muck, and other highly organic soils	
ROCK		Undifferentiated as to type or composition	

### KEY TO BORING AND TEST PIT SYMBOLS







#### CLASSIFICATION TESTS

AL	ATTERBERG LIMITS TEST
SA	SIEVE ANALYSIS
HYD	HYDROMETER ANALYSIS
P200	PERCENT PASSING NO. 200 SIEVE
P4	PERCENT PASSING NO. 4 SIEVE

#### STRENGTH TESTS

TV	FIELD TORVANE (UNDRAINED SHEAR)
UC	LABORATORY UNCONFINED COMPRESSION
TXCU	CONSOLIDATED UNDRAINED TRIAXIAL
TXUU	UNCONSOLIDATED UNDRAINED TRIAXIAL
	UC, CU, UU = 1/2 Deviator Stress

#### SAMPLER TYPE

	MODIFIED CALIFORNIA		HAND SAMPLER
	STANDARD PENETRATION TEST		ROCK CORE
	THIN-WALLED / FIXED PISTON		DISTURBED OR BULK SAMPLE

#### SAMPLER DRIVING RESISTANCE

Modified California and Standard Penetration Test samplers are driven 18 inches with a 140-pound hammer falling 30 inches per blow. Blows for the initial 6-inch drive seat the sampler. Blows for the final 12-inch drive are recorded onto the logs. Sampler refusal is defined as 50 blows during a 6-inch drive. Examples of blow records are as follows:

- 25 sampler driven 12 inches with 25 blows after initial 6-inch drive
- 85/7" sampler driven 7 inches with 85 blows after initial 6-inch drive
- 50/3" sampler driven 3 inches with 50 blows during initial 6-inch drive or beginning of final 12-inch drive

NOTE: Test boring and test pit logs are an interpretation of conditions encountered at the excavation location during the time of exploration. Subsurface rock, soil or water conditions may vary in different locations within the project site and with the passage of time. Boundaries between differing soil or rock descriptions are approximate and may indicate a gradual transition.

<b>Miller Pacific</b> ENGINEERING GROUP	1333 N. McDowell Blvd. Suite C Petaluma, CA 94947 T 707 / 765-6140 F 707 / 765-6222 www.millerpac.com	SOIL CLASSIFICATION CHART	
	East Washington Park Petaluma, California	Designed _____ Drawn <u>NRS</u> Checked _____	A-1 FIGURE
A CALIFORNIA CORPORATION, © 2008, ALL RIGHTS RESERVED FILE: 1206.04BL.dwg		Project No. 1206.04	Date: 9/22/08

OTHER TEST DATA	OTHER TEST DATA	UNDRAINED SHEAR STRENGTH psf (1)	BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT pcf (2)	DEPTH meters feet	SAMPLE	SYMBOL (3)	BORING 1 EQUIPMENT: Track-mounted AT-300 6" solid flight augers DATE: 7/30/08 ELEVATION: 108-Feet* *REFERENCE: Site Plan, Winzler & Kelly, 2008	
		6300 UC	50	14.0		0 - 0			SILTY CLAY (CH) dark brown, dry to slightly moist, very stiff, high plasticity, rootlets present in upper 6 inches	
	62		23.6	100	- 1					
	67/9"		24.1	100	5			SILTY CLAY (CL) medium brown, moist, very stiff, medium to high plasticity		
	58/7"		17.5	110	- 2					
	64		27.8	93	- 3	10		SANDY CLAY (CL) tan-brown, slightly moist, very stiff, low to medium plasticity, trace fine grained gravel		
						- 4				
						15			Bottom of boring at 14.5 feet No groundwater encountered	
						- 5				
						- 6				
						20				

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)  
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m<sup>3</sup> = 0.1571 x DRY UNIT WEIGHT (pcf)  
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

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	Project No. 1206.04      Date: 9/22/08				

OTHER TEST DATA	OTHER TEST DATA	UNDRAINED SHEAR STRENGTH psf (1)	BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT pcf (2)	DEPTH meters feet	SAMPLE	SYMBOL (3)	<p align="center"><b>BORING 2</b></p> <p>EQUIPMENT: Track-mounted AT-300 6" solid flight augers</p> <p>DATE: 7/30/08</p> <p>ELEVATION: 105-Feet*</p> <p>*REFERENCE: Site Plan, Winzler &amp; Kelly, 2008</p>
			30	16.5		0 - 0			<p><b>SILTY CLAY (CH)</b> dark brown, dry to slightly moist, very stiff, high plasticity, rootlets present in upper 6 inches</p>
			38	21.8		- 1			grades to moist
			36	22.3		5			Bottom of boring at 5.0 feet No groundwater encountered
						- 2			
						- 3 10			
						- 4			
						15			
						- 5			
						- 6 20			

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)  
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m<sup>3</sup> = 0.1571 x DRY UNIT WEIGHT (pcf)  
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

<b>Miller Pacific</b> ENGINEERING GROUP	1333 N. McDowell Blvd.	<b>BORING LOG</b>		<table border="1"> <tr><td>Designed</td></tr> <tr><td>Drawn</td></tr> <tr><td>Checked</td></tr> </table>	Designed	Drawn	Checked	<div style="font-size: 2em; font-weight: bold;">A-3</div> <div>FIGURE</div>
	Designed							
Drawn								
Checked								
Suite C	East Washington Park Petaluma, California							
Petaluma, CA 94947	T 707 / 765-6140							
F 707 / 765-6222	www.millerpac.com	Project No. 1206.04	Date: 9/22/08					
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OTHER TEST DATA	OTHER TEST DATA	UNDRAINED SHEAR STRENGTH psf (1)	BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT pcf (2)	DEPTH meters feet	SAMPLE	SYMBOL (3)	<b>BORING 3</b> EQUIPMENT: Track-mounted AT-300 6" solid flight augers  DATE: 7/30/08 ELEVATION: 101-Feet* *REFERENCE: Site Plan, Winzler & Kelly, 2008	
			25	12.5		0 - 0			<b>SILTY CLAY (CH)</b> dark brown, dry to slightly moist, very stiff, high plasticity, rootlets present in upper 6 inches	
			56/9"	16.2	107	- 1			<b>CLAYEY SAND (SC)</b> light brown, moist, dense, fine to medium-grained sand	
			62/9"	23.4	95	5			<b>SANDY CLAY (CL)</b> light to medium brown, moist, very stiff, low to medium plasticity	
			37/9"	26.7		- 3 10			<b>SANDY CLAY (CL)</b> light to medium brown, moist, very stiff, low to medium plasticity	
			41	13.1		- 4			<b>SAND w/ GRAVEL (SM)</b> tan, slightly moist, dense, fine to coarse grained	
						15			Bottom of boring at 14.5 feet No groundwater encountered	
						- 5				
						- 6 20				

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)  
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m<sup>3</sup> = 0.1571 x DRY UNIT WEIGHT (pcf)  
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

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	Designed										
Drawn	NRS										
Checked											
East Washington Park Petaluma, California		Project No. 1206.04      Date: 9/22/08									

OTHER TEST DATA	OTHER TEST DATA	UNDRAINED SHEAR STRENGTH psf (1)	BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT pcf (2)	DEPTH meters feet	SAMPLE	SYMBOL (3)	<p align="center"><b>BORING 4</b></p> <p>EQUIPMENT: Track-mounted AT-300 6" solid flight augers</p> <p>DATE: 7/30/08</p> <p>ELEVATION: 102-Feet*</p> <p>*REFERENCE: Site Plan, Winzler &amp; Kelly, 2008</p>
			40	17.5		0 - 0			<p><b>SILTY CLAY (CH)</b> dark brown, dry to slightly moist, very stiff, high plasticity, trace sand</p> <p>grades to slightly moist</p>
			65	15.6		- 1			
						5			<p>Bottom of boring at 4.5 feet No groundwater encountered</p>
						- 2			
						- 3			
						10			
						- 4			
						15			
						- 5			
						- 6			
						20			

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)  
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m<sup>3</sup> = 0.1571 x DRY UNIT WEIGHT (pcf)  
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

<p align="center"><b>Miller Pacific</b> ENGINEERING GROUP</p>	1333 N. McDowell Blvd. Suite C Petaluma, CA 94947 T 707 / 765-6140 F 707 / 765-6222	<b>BORING LOG</b>		<div style="border: 2px solid black; padding: 10px; text-align: center;"> <span style="font-size: 2em; font-weight: bold;">A-5</span>  FIGURE </div>					
	<small>A CALIFORNIA CORPORATION, © 2008, ALL RIGHTS RESERVED  FILE: 1206.04BL.dwg</small>	www.millerpac.com	East Washington Park Petaluma, California  Project No. 1206.04      Date: 9/22/08		<table border="0"> <tr><td>Designed</td><td>_____</td></tr> <tr><td>Drawn</td><td>NRS</td></tr> <tr><td>Checked</td><td>_____</td></tr> </table>	Designed	_____	Drawn	NRS
Designed	_____								
Drawn	NRS								
Checked	_____								

OTHER TEST DATA	OTHER TEST DATA	UNDRAINED SHEAR STRENGTH psf (1)	BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT pcf (2)	DEPTH meters feet	SAMPLE	SYMBOL (3)	BORING 5 EQUIPMENT: Track-mounted AT-300 6" solid flight augers DATE: 7/30/08 ELEVATION: 100-Feet* *REFERENCE: Site Plan, Winzler & Kelly, 2008	
			53	13.7		0 - 0			SILTY CLAY (CH) dark brown, dry to slightly moist, very stiff, high plasticity, rootlets present in upper 6 inches	
			53/7"	17.0	93	5			SANDY CLAY (CL) medium brown, slightly moist, very stiff, medium plasticity	
			61/9"	20.2	99	10				
			58	21.3	104	15				
						20			Bottom of boring at 14.5 feet No groundwater encountered	



NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)  
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m<sup>3</sup> = 0.1571 x DRY UNIT WEIGHT (pcf)  
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

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	Project No. 1206.04      Date: 9/22/08				

OTHER TEST DATA	OTHER TEST DATA	UNDRAINED SHEAR STRENGTH psf (1)	BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT pcf (2)	DEPTH meters feet	SAMPLE	SYMBOL (3)	BORING 6 EQUIPMENT: Track-mounted AT-300 6" solid flight augers DATE: 7/30/08 ELEVATION: 98-Feet* *REFERENCE: Site Plan, Winzler & Kelly, 2008	
		6300 UC	25	12.7		0 - 0			SILTY CLAY (CH) dark brown, moist, very stiff, high plasticity	
	55/9"		20.2	106	5			SANDY CLAY (CL) medium brown, moist, very stiff, medium plasticity		
	63/9"		19.0	108	10					
	50/10"		21.8	102	15					
						20			Bottom of boring at 14.5 feet No groundwater encountered	

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)  
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m<sup>3</sup> = 0.1571 x DRY UNIT WEIGHT (pcf)  
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

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	Project No. 1206.04      Date: 9/22/08				

OTHER TEST DATA	OTHER TEST DATA	UNDRAINED SHEAR STRENGTH psf (1)	BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT pcf (2)	DEPTH meters feet	SAMPLE	SYMBOL (3)	<p align="center"><b>BORING 7</b></p> <p>EQUIPMENT: Track-mounted AT-300 6" solid flight augers</p> <p>DATE: 7/30/08</p> <p>ELEVATION: 95-Feet*</p> <p>*REFERENCE: Site Plan, Winzler &amp; Kelly, 2008</p>
			18	26.9		0 - 0			<p><b>SILTY CLAY (CH)</b> dark brown, dry to slightly moist, very stiff, high plasticity</p> <p>grades to moist</p>
			58	25.4		- 1  5	 		
						- 2  - 3 10  - 4  15  - 5  - 6 20			<p>Bottom of boring at 4.5 feet No groundwater encountered</p>

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)  
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m<sup>3</sup> = 0.1571 x DRY UNIT WEIGHT (pcf)  
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY



<p align="center"><b>Miller Pacific</b> ENGINEERING GROUP</p>	1333 N. McDowell Blvd. Suite C Petaluma, CA 94947 T 707 / 765-6140 F 707 / 765-6222	<b>BORING LOG</b>		<div style="border: 1px solid black; padding: 5px; text-align: center;"> <span style="font-size: 2em; font-weight: bold;">A-8</span>  FIGURE </div>
	<small>A CALIFORNIA CORPORATION, © 2008, ALL RIGHTS RESERVED  FILE: 1206,04BL.dwg</small>	www.millerpac.com	East Washington Park Petaluma, California  Project No. 1206.04      Date: 9/22/08	



OTHER TEST DATA	OTHER TEST DATA	UNDRAINED SHEAR STRENGTH psf (1)	BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT pcf (2)	DEPTH meters feet	SAMPLE	SYMBOL (3)	<b>BORING 8</b> EQUIPMENT: Track-mounted AT-300 6" solid flight augers  DATE: 7/30/08 ELEVATION: 99.5-Feet* *REFERENCE: Site Plan, Winzler & Kelly, 2008	
			18	18.4		0 - 0			<b>SILTY CLAY (CH)</b> dark brown, dry to slightly moist, very stiff, high plasticity, rootlets present in upper 6 inches	
			36	28.1	90	5			<b>SILTY CLAY (CL)</b> medium brown, moist, very stiff, medium to high plasticity	
			52/6"	15.5	113	10			<b>SANDY CLAY (CL)</b> tan-brown, slightly moist, very stiff, low to medium plasticity, trace fine grained gravel	
			49	21.7		15			Bottom of boring at 14.5 feet No groundwater encountered	
						20				

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)  
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m<sup>3</sup> = 0.1571 x DRY UNIT WEIGHT (pcf)  
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY



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		Project No. 1206.04      Date: 9/22/08			

OTHER TEST DATA	OTHER TEST DATA	UNDRAINED SHEAR STRENGTH psf (1)	BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT pcf (2)	DEPTH meters feet	SAMPLE	SYMBOL (3)	<p align="center"><b>BORING 9</b></p> <p>EQUIPMENT: Track-mounted AT-300 6" solid flight augers</p> <p>DATE: 7/30/08</p> <p>ELEVATION: 100-Feet*</p> <p>*REFERENCE: Site Plan, Winzler &amp; Kelly, 2008</p>
			30	15.9		0 0			SILTY CLAY (CH) dark brown, dry to slightly moist, very stiff, high plasticity
			32/9"	19.0		-1 5			SANDY CLAY (CL) medium brown, slightly moist to moist, very stiff, low to medium plasticity
						-2 -3 -4 -5 -6 20			Bottom of boring at 4.5 feet No groundwater encountered

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)  
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m<sup>3</sup> = 0.1571 x DRY UNIT WEIGHT (pcf)  
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

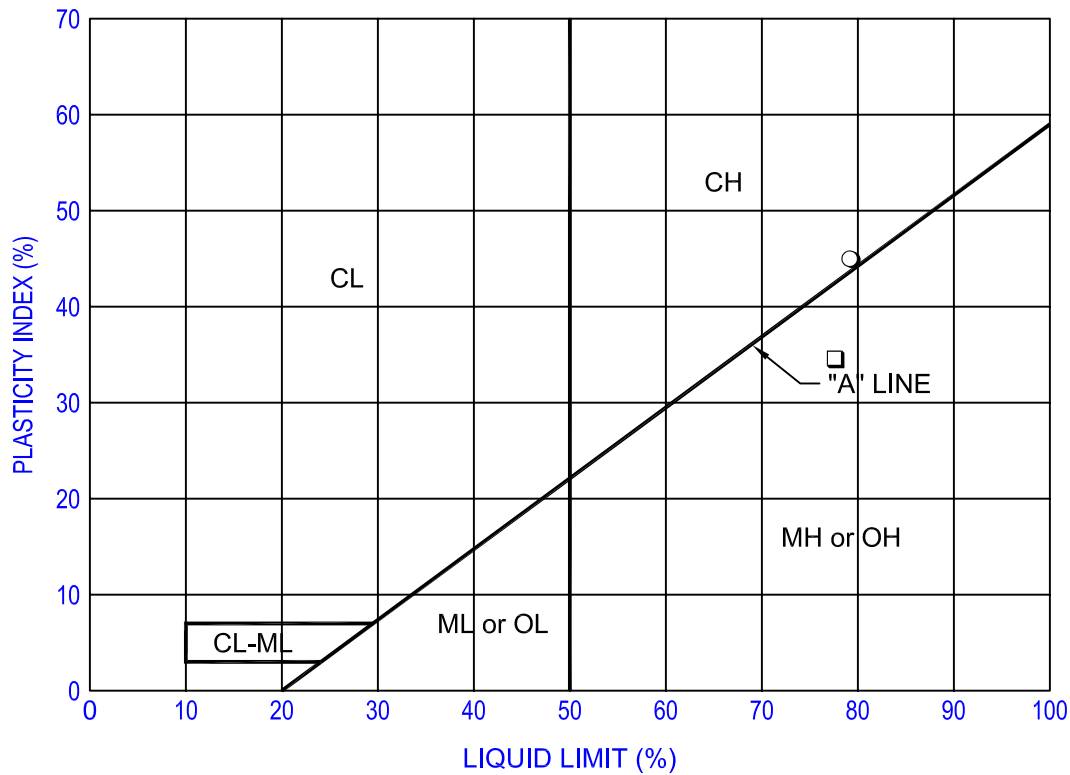
<b>Miller Pacific</b> ENGINEERING GROUP	1333 N. McDowell Blvd.	<b>BORING LOG</b>	
	Suite C	East Washington Park Petaluma, California	
	Petaluma, CA 94947	Designed _____	<div style="font-size: 2em; font-weight: bold;">A-10</div> <div>FIGURE</div>
	T 707 / 765-6140	Drawn <u>NRS</u>	
	F 707 / 765-6222	Checked _____	
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OTHER TEST DATA	OTHER TEST DATA	UNDRAINED SHEAR STRENGTH psf (1)	BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT pcf (2)	DEPTH meters feet	SAMPLE	SYMBOL (3)	<p align="center"><b>BORING 11</b></p> <p>EQUIPMENT: Track-mounted AT-300 6" solid flight augers</p> <p>DATE: 7/30/08</p> <p>ELEVATION: 103.5-Feet*</p> <p>*REFERENCE: Site Plan, Winzler &amp; Kelly, 2008</p>
			30	16.4		0 - 0			<p><b>SILTY CLAY (CH)</b> dark brown, dry to slightly moist, very stiff, high plasticity</p> <p>grades to moist</p>
			53/9"	19.8		- 1  5			<p>Bottom of boring at 4.8 feet No groundwater encountered</p>
						- 2  - 3 10			
						- 4  15			
						- 5  - 6 20			

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)  
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m<sup>3</sup> = 0.1571 x DRY UNIT WEIGHT (pcf)  
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

<b>Miller Pacific</b> ENGINEERING GROUP	1333 N. McDowell Blvd.	<b>BORING LOG</b>		<table border="1"> <tr><td>Designed</td></tr> <tr><td>Drawn</td></tr> <tr><td>Checked</td></tr> </table>	Designed	Drawn	Checked	<div style="font-size: 2em; font-weight: bold;">A-12</div> <div>FIGURE</div>
	Designed							
Drawn								
Checked								
Suite C	East Washington Park Petaluma, California		Project No. 1206.04	Date: 9/22/08				
	Petaluma, CA 94947							
	T 707 / 765-6140							
	F 707 / 765-6222							
	www.millerpac.com							



SYMBOL	SAMPLE SOURCE	CLASSIFICATION	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)
□	BORING 6 1 to 2.5 Feet	CLAYEY SILT (MH) dark brown	77	43	34
○	BORING 11 2 to 2.5 Feet	SILTY CLAY (CH) dark brown	79	34	45

REFERENCE: Liquid Limit, Plastic Limit, and Plasticity Index of Soils, ASTM D 4318

<b>Miller Pacific</b> ENGINEERING GROUP	1333 N. McDowell Blvd.	PLASTICITY CHART	
	Suite C	East Washington Park Petaluma, California	
	Petaluma, CA 94947	Designed _____	<div style="font-size: 2em; font-weight: bold;">A-13</div> <div style="font-weight: bold;">FIGURE</div>
	T 707 / 765-6140	Drawn <u>NRS</u>	
	F 707 / 765-6222	Checked _____	
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**APPENDIX 2**  
**MUSCO Report**

**MUSCO LIGHTING, INC.**  
**Light Structure Pole and Foundation Standard**

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**ITEM : Structural Calculations  
Pole Foundation Standard**

**PROJECT : Petaluma Community Sports Field  
Baseball Diamond  
Petaluma, CA**

**PROJECT NO : 188270  
363.787**

**DATE : 5/3/2021**



**ENGINEER :**  **KNA  
STRUCTURAL  
ENGINEERS**  
**JOSH RANDALL, SE No. 4506  
9931 Muirlands Blvd  
Irvine, Ca 92618**

**MUSCO LIGHTING, INC.**  
**Light Structure Pole and Foundation Standard**

Calculation Index

**CONTENTS:**

<u>Page</u>	<u>Item</u>	
1-3	LSS70-A (w/ 3 Fixtures)	-Wind Analysis
4-5	LSS70-A (w/ 3 Fixtures)	-Seismic Analysis
6-8	LSS70-B (w/ 5 Fixtures)	-Wind Analysis
9-10	LSS70-B (w/ 5 Fixtures)	-Seismic Analysis
11	Precast Base by Cretex	
12-14	LSS70-C (w/ 7 Fixtures)	-Wind Analysis
15-16	LSS70-C (w/ 7 Fixtures)	-Seismic Analysis
17	Precast Base by Cretex	
18	Foundation Check	
APPENDIX A	ATC Hazards by Location Report	
APPENDIX B	Seismic Design Parameters from Soils Report	

**CODE REFERENCE:**

**2019 CBC**

**ACI 318-14**

Building Code Requirements for Structural Concrete

**AISC 360-16**

Specifications for Structural Steel Buildings





POLE DESIGNATION: LS70-A W/ 3 FIXTURES  
 MANUFACTURER: MUSCO  
 PROJECT NO: 188270

JOB NO: 363.787  
 PROJECT: Petaluma Community Sports Field  
 LOCATION: Petaluma, CA

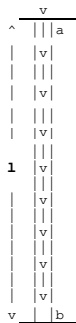
ASCE 7-16  
 WIND CRITERIA 92 MPH, EXP C  
 LOAD COMB 1.2 DEAD + 1.0 WIND

POLE ID: C1, C2  
 (A1, D1, D2 Sim.)

P = SUPERIMPOSED WT + POLE WT

LED 1500  
 EPA/FIXTURE\*, Af = 3.1 ft2  
 D.L./FIXTURE\*\* = 91.0 lbs  
 D.L. ECE/FIXTURE\*\*\* = 20.0 lbs

EPA = EFFECTIVE PROJECTED AREA OF LIGHT FIXTURE  
 INCLUDING CROSSARM, PER MUSCO  
 \*\*D.L. = DEAD LOAD OF FIXTURE, &  
 CROSSARM, PER MUSCO  
 \*\*\*D.L. = DEAD LOAD OF ECE,  
 PER MUSCO



<-- <-- FIXTURES, F/Af = qz \* Gf \* Cf = 32.33 PSF MAX (29.4-1)  
 <-- <-- where qz = .00256 \* Kz \* Kzt \* Kd \* Ke (V)^2 = 25.56 PSF MAX (26.10-1)

ATTACHMENT TYPE	NUMBER	DIST. FROM TOP POLE, FT	PA SQ FT	Cf	EPA SQ FT	Kz	qz PSF	WIND, F LBS	WEIGHT, P LBS
LED1500	3.0	0.5	1.0	1.0	3.11	1.178	25.52	301	273
	0.0	3.0	1.3	1.3	3.11	1.169	25.33	0	0
	0.0	5.5	1.3	1.3	3.11	1.160	25.13	0	0
	0.0	8.0	1.3	1.3	3.11	1.150	24.93	0	0
	0.0	10.5	1.3	1.3	3.11	1.141	24.72	0	0
	0.0	13.0	1.3	1.3	3.11	1.131	24.50	0	0
	0.0	15.5	1.3	1.3	3.11	1.120	24.28	0	0
	0.0	18.0	1.3	1.3	3.11	1.110	24.04	0	0
LED1200	2.0	11.6	2.51	1.3	3.27	1.137	24.63	203	131
LED575	2.0	56.6	1.82	1.3	2.37	0.849	18.39	110	109
ECE	7.0	59.9	9.00	1.3	11.70	0.849	18.39	272	140
								TOTALS =	887 653

POLE, F/Af = qz \* Gf \* Cf = 38.80 PSF MAX (29.4-1)  
 where qz = .00256 \* Kz \* Kzt \* Kd \* Ke (V)^2 = 25.56 PSF MAX (26.10-1)

LOADING DIAGRAM

INPUT

-> l = 71.55 ft. (ht. from adj. grade)  
 -> l = 71.55 ft. (ht. from grade)  
 -> tA = 0.12 in. (pole thk. @ top)  
 -> dA = 4.75 in. (pole diam. @ top)  
 -> dB = 13.4 in. (pole diam. @ btm)  
 -> tB = 0.179 in. (pole thk. @ btm)  
 -> Fy = 38.0 ksi (fixt mount sect. = 5.25 ft)  
 -> Fy = 55.0 ksi (other pole sect.)  
 -> E = 29,000 ksi  
 -> Kzt = 1 (Figure 26.8-1)  
 -> Kd = 1 (Table 26.6-1)  
 -> Kz = 1.179 MAX-EXP C @ 71.6 FT. (Table 26.10-1)  
 -> Ke = 1.00 (Table 26.9-1)  
 -> Cf = 1.00 LIGHT FIXTURE (INCLUDED IN EPA)  
 -> Cf = 1.200 MAX (VARIES 0.5-1.2 FOR RND POLE) (Figure 29.5-1)  
 POLE DAMPING, beta = 0.025 Per Musco test

OUTPUT

-> POLE NATURAL FREQUENCY = 0.403 Hz 1/(2PI\*(DELTA/386)^0.5) where DELTA is due to self weight  
 -> Gf = 1.27 (Section 26.11.5) (Reference Vibration Problems in Engineering by Timoshenko, 4th ED, pg.34)

Pole Properties:

Ia = 4.68 in4 taper = 0.140 in/ft  
 Ib = 162 in4 db/da = 2.821  
 ra = 1.638 in rb = 4.675 in.  
 Aa = 1.745 in2 Ab = 7.43 in2  
 Sa = 1.97 in3 Sb = 24.25 in3

From Critical Buckling Loads of Tapered Columns, ASCE 2/62:

n = Log (Ib/(Ia)/Log (dB/dA) = 3.42  
 P\* = (Ib/Ia) / (Ib/Ia)^.333 = 10.6  
 kl/req\* (1/(P\*)^0.5) [kl/ra] = 338 (where k = 2.1)

AISC 360-16 Specification Table B4.1, Case 15

for Fy = 55.0 KSI 38 KSI  
 D/t < .45E/Fy = 237 343 (MAX)  
 D/t < .31E/Fy = 163 237 Noncompact  
 D/t < .07E/Fy = 37 53 Compact  
 D/t < .11E/Fy = 58 84 Slender element Section for Uniform Comp

SHEAR,F= 1.184 KIPS	MOMENT, M= 48.57 K-FT	e= M/F = 41.02 FT	AXIAL,P= 1.736 KIPS	ASD Forces at groundline (for foundation design)
SHEAR,F= 1.973 KIPS	MOMENT, M= 80.94 K-FT	e= M/F = 41.02 FT	AXIAL,P= 2.083 KIPS	Nominal Forces at groundline

M < φMn = 115 K-FT Precast Base O.K.  
 Pole Stress Check = 0.876 Max. < 1 Pole O.K.  
 Max. Deflection = 83.339 Inch < 0.10H = 86 Inch AASHTO 10.4.2

Section 26.11.5 Gust-Effect Factor			
constant epsilon, e	= 0.2	LZ	= 527.0
constant l	= 500	N1	= 2.326
Vz	= 91.33	Rn	= 0.082
4.6n1h/Vz	= 1.452		
4.6n1B/Vz	= 0.015	R	= 1.215
15.4n1L/Vz	= 0.051	gR	= 3.967
		c	= 0.200
Rh	= 0.464	lz	= 0.191
RB	= 0.990	Q	= 0.920
RL	= 0.967	G	= 0.886
Gf = 1.265			

Distance from top of Pole	Outside Diameter of Pole, D	Pole thick, t	D/t	Kz	qz PSF	Cf Pole	kl/r equiv.	E3-4 Fe	E3-2 or E3-3 Design comp strength, KIPS	Acting Manufactured, P KIPS	F8.1-F8.4 Design fld strength, K-FT	Req'd flex. strength, M K-FT	Pr/Pc	H1-1b for Pr/Pc < 0.2	H1-1a for Pr/Pc > 0.2	2nd Order /1st Order Moment FT-K	Req'd shea length, O.K. KIPS	1st Order Delta IN	C2.2a P-Delta Moment FT-K	Total 2nd Order Moment FT-K	E7-19 Q	ACTING MOM DUE TO DL	M/I	DEFL DUE TO DL IN	
0	4.75	0.12	39.6	1.179	25.56	1.2	338	2.51	3.46	0.000	7.89	0.0	0.000	0.000	N.A.	1.000	Y	0.000	83.3	0.0	0.0	1.40	0.00	0.000	60.2
1	4.75	0.12	39.6	1.176	25.48	1.2	338	2.51	3.46	0.279	7.89	0.2	0.097	0.077	N.A.	1.413	Y	0.316	81.0	0.1	0.2	1.40	0.00	0.031	58.5
2	4.75	0.12	39.6	1.172	25.40	1.2	338	2.51	3.46	0.285	7.89	0.5	0.099	0.127	N.A.	1.273	Y	0.332	78.7	0.1	0.6	1.40	0.28	0.092	56.8
3	4.75	0.12	39.6	1.169	25.33	1.2	338	2.51	3.46	0.291	7.89	0.8	0.101	0.180	N.A.	1.243	Y	0.347	76.3	0.2	1.0	1.40	0.57	0.154	55.2
4	4.75	0.12	39.6	1.165	25.25	1.2	338	2.51	3.46	0.297	7.89	1.2	0.103	0.234	N.A.	1.228	Y	0.362	74.0	0.3	1.4	1.40	0.87	0.217	53.5
5	4.75	0.12	39.6	1.162	25.17	1.2	338	2.51	3.46	0.303	7.89	1.5	0.105	0.291	N.A.	1.219	Y	0.377	71.7	0.3	1.9	1.40	1.17	0.268	51.8
6	4.90	0.12	40.8	1.158	25.09	1.2	338	2.51	3.57	0.309	11.02	1.9	0.104	0.264	N.A.	1.212	Y	0.392	69.4	0.4	2.3	1.16	1.47	0.302	50.2
7	5.04	0.12	42.0	1.154	25.01	1.2	338	2.51	3.68	0.316	11.62	2.3	0.103	0.293	N.A.	1.206	Y	0.408	67.2	0.5	2.8	1.14	1.78	0.331	48.6
8	5.18	0.12	43.2	1.150	24.93	1.2	338	2.51	3.78	0.322	12.22	2.7	0.102	0.321	N.A.	1.201	Y	0.424	64.9	0.6	3.3	1.13	2.10	0.355	47.0
9	5.32	0.12	44.3	1.147	24.84	1.2	338	2.51	3.89	0.329	12.85	3.2	0.102	0.347	N.A.	1.197	Y	0.441	62.7	0.6	3.8	1.12	2.43	0.376	45.4
10	5.46	0.12	45.5	1.143	24.76	1.2	338	2.51	3.99	0.336	13.49	3.6	0.101	0.371	N.A.	1.193	Y	0.458	60.5	0.7	4.3	1.11	2.76	0.392	43.8
11	5.60	0.12	46.7	1.139	24.67	1.2	338	2.51	4.10	0.343	14.14	4.1	0.101	0.394	N.A.	1.189	Y	0.475	58.4	0.8	4.9	1.10	3.10	0.406	42.3
12	5.74	0.12	47.8	1.135	24.59	1.2	338	2.51	4.20	0.482	14.81	4.7	0.138	0.444	N.A.	1.187	Y	0.696	56.3	0.9	5.6	1.09	3.45	0.424	40.7
13	5.88	0.12	49.0	1.131	24.50	1.2	338	2.51	4.31	0.489	15.50	5.4	0.136	0.479	N.A.	1.181	Y	0.714	54.2	1.0	6.4	1.08	3.93	0.447	39.3
14	6.02	0.12	50.2	1.127	24.41	1.2	338	2.51	4.41	0.497	16.20	6.1	0.135	0.511	N.A.	1.177	Y	0.732	52.1	1.1	7.2	1.07	4.43	0.466	37.8
15	6.16	0.12	51.3	1.122	24.32	0.7	338	2.51	4.52	0.505	16.91	6.8	0.134	0.542	N.A.	1.173	Y	0.743	50.1	1.2	8.0	1.06	4.93	0.482	36.3
16	6.30	0.12	52.5	1.118	24.23	0.7	338	2.51	4.62	0.513	17.64	7.6	0.133	0.570	N.A.	1.169	Y	0.754	48.1	1.3	8.9	1.05	5.44	0.495	34.9
17	6.44	0.12	53.7	1.114	24.14	0.7	338	2.51	4.72	0.521	18.39	8.4	0.132	0.596	N.A.	1.166	Y	0.766	46.2	1.4	9.7	1.04	5.95	0.505	33.5
18	6.58	0.12	54.8	1.110	24.04	0.7	338	2.51	4.83	0.530	19.15	9.1	0.132	0.620	N.A.	1.163	Y	0.777	44.3	1.5	10.6	1.03	6.48	0.514	32.2
19	6.72	0.12	56.0	1.105	23.95	0.7	338	2.51	4.93	0.539	19.93	9.9	0.131	0.642	N.A.	1.160	Y	0.789	42.4	1.6	11.5	1.02	7.01	0.521	30.9
20	6.86	0.12	57.2	1.101	23.85	0.7	338	2.51	5.04	0.547	20.72	10.7	0.130	0.663	N.A.	1.157	Y	0.801	40.6	1.7	12.4	1.02	7.56	0.526	29.6
21	7.00	0.12	58.3	1.096	23.75	0.7	338	2.51	5.14	0.556	21.53	11.5	0.130	0.682	N.A.	1.155	Y	0.813	38.9	1.8	13.3	1.01	8.11	0.530	28.3
22	7.14	0.12	59.5	1.092	23.65	0.7	338	2.51	5.25	0.566	22.35	12.3	0.129	0.700	N.A.	1.152	Y	0.825	37.1	1.9	14.2	1.00	8.67	0.533	27.1
23	7.28	0.12	60.7	1.087	23.55	0.7	338	2.51	5.35	0.575	23.19	13.2	0.129	0.717	N.A.	1.150	Y	0.838	35.5	2.0	15.1	1.00	9.24	0.535	25.9
24	7.42	0.12	61.8	1.082	23.45	0.7	338	2.51	5.46	0.585	24.04	14.0	0.129	0.733	N.A.	1.148	Y	0.851	33.8	2.1	16.1	0.99	9.82	0.536	24.7
25	7.56	0.12	63.0	1.077	23.35	0.7	338	2.51	5.56	0.594	24.91	14.9	0.128	0.748	N.A.	1.146	Y	0.864	32.3	2.2	17.0	0.98	10.41	0.536	23.6
26	7.70	0.12	64.2	1.073	23.24	0.7	338	2.51	5.67	0.604	25.79	15.7	0.128	0.761	N.A.	1.143	Y	0.877	30.7	2.3	18.0	0.98	11.01	0.536	22.5
27	7.84	0.12	65.3	1.068	23.13	0.7	338	2.51	5.77	0.614	26.69	16.6	0.128	0.774	N.A.	1.141	Y	0.890	29.2	2.3	19.0	0.97	11.62	0.535	21.4
28	7.98	0.12	66.5	1.062	23.02	0.7	338	2.51	5.88	0.624	27.60	17.5	0.128	0.787	N.A.	1.139	Y	0.903	27.8	2.4	20.0	0.97	12.24	0.534	20.4
29	8.12	0.12	67.7	1.057	22.91	0.7	338	2.51	5.98	0.635	28.53	18.4	0.127	0.798	N.A.	1.137	Y	0.917	26.4	2.5	21.0	0.96	12.87	0.532	19.4
30	8.26	0.12	68.8	1.052	22.79	0.7	338	2.51	6.09	0.646	29.48	19.3	0.127	0.809	N.A.	1.135	Y	0.931	25.0	2.6	22.0	0.96	13.51	0.530	18.4
31	8.40	0.12	70.0	1.047	22.68	0.7	338	2.51	6.19	0.656	30.43	20.3	0.127	0.819	N.A.	1.133	Y	0.945	23.7	2.7	23.0	0.95	14.16	0.528	17.5
32	8.54	0.12	71.2	1.041	22.56	0.7	338	2.51	6.29	0.667	31.41	21.2	0.127	0.828	N.A.	1.131	Y	0.959	22.5	2.8	24.0	0.95	14.82	0.525	16.5
33	8.68	0.12	72.3	1.036	22.44	0.7	338	2.51	6.40	0.678	32.40	22.2	0.127	0.837	N.A.	1.129	Y	0.973	21.2	2.9	25.1	0.94	15.49	0.523	15.7
34	8.82	0.12	73.5	1.030	22.31	0.7	338	2.51	6.50	0.690	33.40	23.2	0.127	0.846	N.A.	1.127	Y	0.988	20.1	2.9	26.1	0.94	16.18	0.520	14.8
35	8.96	0.12	74.7	1.024	22.19	0.7	338	2.51	6.61	0.701	34.43	24.2	0.127	0.854	N.A.	1.125	Y	1.002	18.9	3.0	27.2	0.94	16.87	0.517	14.0
36	9.10	0.12	75.8	1.018	22.06	0.7	338	2.51	6.71	0.713	35.46	25.2	0.127	0.862	N.A.	1.123	Y	1.017	17.8	3.1	28.3	0.93	17.58	0.513	13.2
37	9.24	0.12	77.0	1.012	21.93	0.7	338	2.51	6.82	0.725	36.51	26.2	0.128	0.869	N.A.	1.121	Y	1.032	16.8	3.2	29.4	0.93	18.30	0.510	12.4
38	9.38	0.12	78.2	1.006	21.79	0.7	338	2.51	6.92	0.742	37.58	27.3	0.129	0.876	N.A.	1.119	Y	1.047	15.8	3.3	30.5	0.92	19.03	0.446	11.7
39	9.52	0.179	51.4	0.999	21.65	0.7	338	2.51	10.06	0.760	56.29	28.3	0.091	0.607	N.A.	1.118	Y	1.061	14.8	3.3	31.6	1.06	19.78	0.381	11.0
40	9.34	0.179	52.2	0.993	21.51	0.7	338	2.51	10.22	0.778	57.91	29.4	0.091	0.612	N.A.	1.116	Y	1.076	13.9	3.4	32.8	1.05	20.55	0.378	10.4
41	9.48	0.179	53.0	0.986	21.36	0.7	338	2.51	10.37	0.796	59.56	30.5	0.092	0.616	N.A.	1.114	Y	1.091	13.0	3.5	33.9	1.04	21.33	0.375	9.7
42	9.62	0.179	53.8	0.979	21.22	0.7	338	2.51	10.53	0.814	61.22	31.6	0.093	0.620	N.A.	1.112	Y	1.106	12.2	3.5	35.1	1.04	22.14	0.372	9.1
43	9.76	0.179	54.5	0.972	21.06	0.7	338	2.51	10.69	0.833	62.92	32.7	0.093	0.623	N.A.	1.110	Y	1.121	11.4	3.6	36.3	1.03	22.96	0.370	8.5
44	9.90	0.179	55.3	0.965	20.90	0.7	338	2.51	10.84	0.851	64.63	33.8	0.094	0.627	N.A.	1.109	Y	1.136	10.6	3.7	37.5	1.03	23.80	0.367	7.9
45	10.04	0.179	56.1	0.957	20.74	0.7	338	2.51	11.00	0.871	66.37	34.9	0.095	0.630	N.A.	1.107	Y	1.151	9.8	3.7	38.7	1.02	24.66	0.364	7.3
46	10.18	0.179	56.9	0.950	20.58	0.7	338	2.51	11.16	0.890	68.12	36.1	0.096	0.634	N.A.	1.105	Y	1.167	9.1	3.8	39.9	1.02	25.54	0.362	6.8
47	10.32	0.179	57.7	0.942	20.40	0.7	338	2.51	11.31	0.910	69.91	37.3	0.097	0.637	N.A.	1.104	Y	1.182	8.4	3.9	41.1	1.01	26.44	0.359	6.3
48	10.46	0.179	58.4	0.933	20.23	0.7	338	2.51	11.47	0.930	71.71	38.5	0.097	0.640	N.A.	1.102	Y	1.198	7.7	3.9	42.4	1.01	27.36	0.357	5.8
49	10.60	0.179	59.2	0.925	20.04	0.7	338	2.51	11.62	0.950	73.54	39.7	0.098	0.643	N.A.	1.101	Y	1.213	7.0	4.0	43.7	1.00	28.30	0.354	5.3
50	10.74	0.179	60.0	0.916	19.85	0.7	338	2.51	1																



**Reference:** 2019 CBC, ASCE 7-16

**INPUT:**

Job Location:	Petaluma, CA		
Site Class	D		Per Soil Report
0.2 Sec MCE, S <sub>s</sub>	1.860	g	Per Soil Report
1.0 Sec MCE, S <sub>1</sub>	0.710	g	Per Soil Report
S <sub>MS</sub> = F <sub>a</sub> S <sub>s</sub>	1.700	g	Per Soil Report
S <sub>M1</sub> = F <sub>v</sub> S <sub>1</sub>	1.550	g	Per Soil Report
S <sub>DS</sub> = 2/3 S <sub>MS</sub>	1.133	g	Per Soil Report
S <sub>D1</sub> = 2/3 S <sub>M1</sub>	1.033	g	Per Soil Report
T <sub>s</sub> = S <sub>D1</sub> /S <sub>DS</sub>	0.912	sec	
Long Period transition period, T <sub>L</sub>	8.0	sec	ASCE 7-16 -Figure 22-12
Risk Category	II		Table 1604.5
Seismic Design Category	D		2019 CBC Section 1613.3.5

**OUTPUT:**

<b>Light Pole Class</b>	LS70A		
Fundamental Period, T	2.48	sec	See structural calculations, pg 1
Seismic coeff., R	1.5		ASCE 7-16 Table 15.4-2
Overstrength Factor, Ω	1.5		ASCE 7-16 Table 15.4-2
Importance Factor, I	1.00		ASCE 7-16 Section 15.4.1.1 & Table 1.5-2
Redundancy factor, ρ	1.0		ASCE 7-16 Section 15.6
<b>DESIGN SEISMIC FORCE</b>			
V = C <sub>s</sub> W			ASCE 7-16 Eqn. 12.8-1
C <sub>s</sub> = S <sub>DS</sub> /(R/I) for T ≤ T <sub>s</sub>	0.756	g	ASCE 7-16 Eqn. 12.8-2
C <sub>s</sub> max. for T ≤ T <sub>L</sub> , C <sub>s</sub> = S <sub>D1</sub> /T(R/I)	0.278	g	ASCE 7-16 Eqn. 12.8-3
C <sub>s</sub> min = 0.044 S <sub>DS</sub>   ≥ 0.03	0.050	g	ASCE 7-16 Eqn. 15.4-1
if S <sub>1</sub> ≥ 0.6g, C <sub>s</sub> min = 0.8 S <sub>1</sub> /(R/I)	0.379	g	ASCE 7-16 Eqn. 15.4-2
Load Combination, 1.2D+ 1.0E			ASCE 7-16 Section 2.3.2 Load Comb 5
where E = E <sub>h</sub> + E <sub>v</sub>			ASCE 7-16 Eqn. 12.4-1
and E <sub>h</sub> = ρQ <sub>E</sub>	0.379	W	ASCE 7-16 Eqn. 12.4-3
and E <sub>v</sub> = 0.2 S <sub>DS</sub> D	0.227	D	ASCE 7-16 Eqn. 12.4-4
Load Combination, 1.2D + (ρQ <sub>E</sub> + 0.2 S <sub>DS</sub> D)			
Load Combination, 1.2D + (ρQ <sub>E</sub> + 0.2 S <sub>DS</sub> D)	1.427	D	+ 0.379 W

Total Seismic Weight, W = 2.262 kips See following page

SEISMIC SHEAR, V = 1.059 kips < 1.973 kips WIND SHEAR

WIND CONTROLS

Vertical Distribution of Seismic Force,  $F_x = C_{vx}V$  ASCE7-16 Eqn. 12.8-11 & Section 12.8.5  
 $k = 1.991$

Item	w	$h_x$	$w_x h_x^k$	$w_x h_x^k / \sum w_x h_x^k$	$C_{vx} * V$	OTM
fixtures	0.273	71	1322	0.430	0.368	26.12
			0	0.000	0.000	0.00
			0	0.000	0.000	0.00
Top Pole Section	0.034	68.9	155	0.050	0.043	2.97
2nd Pole Section	0.343	49.8	820	0.266	0.228	11.36
1st Pole Section	0.698	18.76	239	0.078	0.066	1.25
			0	0.000	0.000	0.00
			0	0.000	0.000	0.00
			0	0.000	0.000	0.00
			0	0.000	0.000	0.00
LED1200	0.131	60.00	454	0.147	0.126	7.58
LED575	0.109	15.00	24	0.008	0.007	0.10
ECE	0.140	15.00	31	0.010	0.009	0.13
1/2 Precast base above grade	0.534	8.00	34	0.011	0.009	0.07
Sum	2.262		3079	1.000	0.857	49.59
Total Dead Load at grade	2.796					

SEISMIC OTM = 49.59 kip-ft < 80.94 kip-ft Wind OTM WIND CONTROLS



Distance from top of Pole FT	Outside Diameter of Pole, D IN	Pole thick, t IN	D/t	Kz	qz PSF	Cf Pole	kl/r equiv.	E3-4 Fe	E3-2 or E3-3 Design comp strength, P KIPS	Acting Manufactured, P KIPS	F8.1-F8.4 Design flex strength, M K-FT	Eq'd flex. strength, M K-FT	Pr/Pc	H1-1b for Pr/Pc < 0.2	H1-1a for Pr/Pc > 0.2	2nd Order /1st Order Moment FT-K	Req'd shea strength, O.K.	1st Order Delta IN	C2.2a P-Delta Moment FT-K	Total 2nd Order Moment FT-K	E7-19 Q	ACTING MOM DUE TO DL	M/I	DEFL DUE TO DL IN	
0	4.75	0.120	39.6	1.182	25.62	1.2	341	2.45	3.38	0.000	7.89	0.0	0.000	0.000	N.A.	1.000	Y	0.000	87.5	0.0	0.0	1.40	0.00	0.000	76.12
1	4.75	0.120	39.6	1.179	25.54	1.2	341	2.45	3.38	0.470	7.89	0.3	0.167	0.130	N.A.	1.432	Y	0.512	85.2	0.1	0.4	1.40	0.00	0.051	74.11
2	4.75	0.120	39.6	1.175	25.47	1.2	341	2.45	3.38	0.476	7.89	0.8	0.169	0.211	N.A.	1.287	Y	0.528	82.8	0.2	1.0	1.40	0.48	0.153	72.11
3	4.75	0.120	39.6	1.172	25.39	1.2	341	2.45	3.38	0.482	7.89	1.3	0.171	0.294	N.A.	1.256	Y	0.544	80.5	0.3	1.6	1.40	0.95	0.256	70.11
4	4.75	0.120	39.6	1.168	25.32	1.2	341	2.45	3.38	0.488	7.89	1.9	0.173	0.380	N.A.	1.241	Y	0.560	78.2	0.4	2.3	1.40	1.44	0.360	68.13
5	4.75	0.120	39.6	1.165	25.24	1.2	341	2.45	3.38	0.497	7.89	2.4	0.176	0.468	N.A.	1.232	Y	0.575	75.8	0.6	3.0	1.40	1.93	0.370	66.16
6	4.90	0.179	27.4	1.161	25.16	1.2	341	2.45	5.14	0.506	17.52	3.0	0.118	0.270	N.A.	1.225	Y	0.591	73.6	0.7	3.7	1.40	2.43	0.346	64.21
7	5.04	0.179	28.2	1.157	25.08	1.2	341	2.45	5.30	0.516	18.44	3.6	0.117	0.298	N.A.	1.220	Y	0.607	71.3	0.8	4.4	1.38	2.94	0.379	62.29
8	5.18	0.179	28.9	1.154	25.00	1.2	341	2.45	5.45	0.526	19.39	4.2	0.116	0.323	N.A.	1.216	Y	0.624	69.1	0.9	5.1	1.36	3.46	0.405	60.39
9	5.32	0.179	29.7	1.150	24.91	1.2	341	2.45	5.60	0.536	20.35	4.9	0.115	0.347	N.A.	1.212	Y	0.641	66.9	1.0	5.9	1.34	3.99	0.428	58.51
10	5.46	0.179	30.5	1.146	24.83	1.2	341	2.45	5.75	0.546	21.35	5.5	0.114	0.369	N.A.	1.208	Y	0.658	64.7	1.1	6.7	1.32	4.53	0.446	56.65
11	5.60	0.179	31.3	1.142	24.75	1.2	341	2.45	5.91	0.557	22.36	6.2	0.113	0.389	N.A.	1.205	Y	0.676	62.6	1.3	7.4	1.31	5.08	0.460	54.82
12	5.74	0.179	32.1	1.138	24.66	1.2	341	2.45	6.06	0.568	23.40	6.9	0.112	0.409	N.A.	1.202	Y	0.694	60.5	1.4	8.2	1.29	5.65	0.472	53.02
13	5.88	0.179	32.8	1.134	24.57	1.2	341	2.45	6.21	0.579	24.46	7.6	0.112	0.427	N.A.	1.199	Y	0.713	58.4	1.5	9.1	1.28	6.22	0.481	51.25
14	6.02	0.179	33.6	1.130	24.49	1.2	341	2.45	6.36	0.590	25.54	8.3	0.111	0.444	N.A.	1.196	Y	0.732	56.4	1.6	9.9	1.26	6.80	0.488	49.50
15	6.16	0.179	34.4	1.126	24.40	0.7	341	2.45	6.52	0.602	26.65	9.0	0.111	0.460	N.A.	1.193	Y	0.743	54.4	1.7	10.8	1.25	7.40	0.494	47.79
16	6.30	0.179	35.2	1.122	24.31	0.7	341	2.45	6.67	0.614	27.78	9.8	0.110	0.474	N.A.	1.191	Y	0.754	52.5	1.9	11.6	1.24	8.01	0.498	46.10
17	6.44	0.179	36.0	1.118	24.22	0.7	341	2.45	6.82	0.626	28.93	10.5	0.110	0.488	N.A.	1.188	Y	0.766	50.5	2.0	12.5	1.22	8.63	0.501	44.44
18	6.58	0.179	36.8	1.113	24.12	0.7	341	2.45	6.97	0.639	30.10	11.3	0.110	0.501	N.A.	1.186	Y	0.778	48.6	2.1	13.4	1.21	9.26	0.503	42.81
19	6.72	0.179	37.5	1.109	24.03	0.7	341	2.45	7.13	0.651	31.30	12.1	0.110	0.512	N.A.	1.184	Y	0.790	46.8	2.2	14.3	1.20	9.90	0.503	41.21
20	6.86	0.179	38.3	1.105	23.93	0.7	341	2.45	7.28	0.664	32.52	12.9	0.110	0.523	N.A.	1.182	Y	0.803	45.0	2.3	15.2	1.19	10.56	0.503	39.65
21	7.00	0.179	39.1	1.100	23.84	0.7	341	2.45	7.43	0.678	33.76	13.7	0.109	0.534	N.A.	1.180	Y	0.815	43.2	2.5	16.2	1.18	11.23	0.503	38.11
22	7.14	0.179	39.9	1.096	23.74	0.7	341	2.45	7.58	0.691	35.02	14.5	0.109	0.543	N.A.	1.178	Y	0.828	41.5	2.6	17.1	1.17	11.92	0.502	36.60
23	7.28	0.179	40.7	1.091	23.64	0.7	341	2.45	7.74	0.706	36.31	15.4	0.120	0.559	N.A.	1.177	Y	0.905	39.8	2.7	18.1	1.16	12.62	0.501	35.12
24	7.42	0.179	41.5	1.086	23.54	0.7	341	2.45	7.89	0.720	37.62	16.3	0.120	0.569	N.A.	1.175	Y	0.918	38.1	2.9	19.1	1.15	13.40	0.502	33.67
25	7.56	0.179	42.2	1.081	23.43	0.7	341	2.45	8.04	0.805	38.95	17.2	0.120	0.579	N.A.	1.173	Y	0.931	36.4	3.0	20.2	1.14	14.20	0.502	32.25
26	7.70	0.179	43.0	1.077	23.33	0.7	341	2.45	8.19	0.819	40.31	18.2	0.120	0.588	N.A.	1.172	Y	0.945	34.9	3.1	21.3	1.13	15.01	0.501	30.87
27	7.84	0.179	43.8	1.072	23.22	0.7	341	2.45	8.35	0.834	41.69	19.1	0.120	0.596	N.A.	1.170	Y	0.958	33.3	3.2	22.4	1.12	15.84	0.500	29.51
28	7.98	0.179	44.6	1.067	23.11	0.7	341	2.45	8.50	0.850	43.09	20.1	0.120	0.604	N.A.	1.168	Y	0.972	31.8	3.4	23.4	1.12	16.68	0.499	28.18
29	8.12	0.179	45.4	1.062	23.00	0.7	341	2.45	8.65	0.865	44.51	21.1	0.120	0.612	N.A.	1.166	Y	0.986	30.3	3.5	24.6	1.11	17.53	0.497	26.88
30	8.26	0.179	46.1	1.056	22.89	0.7	341	2.45	8.80	0.881	45.96	22.0	0.120	0.619	N.A.	1.165	Y	1.000	28.8	3.6	25.7	1.10	18.41	0.495	25.61
31	8.40	0.179	46.9	1.051	22.78	0.7	341	2.45	8.96	0.896	47.43	23.1	0.120	0.625	N.A.	1.163	Y	1.015	27.4	3.8	26.8	1.09	19.30	0.535	24.37
32	8.10	0.179	45.3	1.046	22.66	0.7	341	2.45	8.63	0.911	44.35	24.1	0.127	0.694	N.A.	1.161	Y	1.029	26.0	3.9	28.0	1.11	20.20	0.575	23.16
33	8.24	0.179	46.1	1.040	22.54	0.7	341	2.45	8.79	0.927	45.80	25.1	0.127	0.699	N.A.	1.160	Y	1.043	24.7	4.0	29.1	1.10	21.12	0.570	21.98
34	8.38	0.179	46.8	1.035	22.42	0.7	341	2.45	8.94	0.943	47.26	26.2	0.127	0.704	N.A.	1.158	Y	1.057	23.4	4.1	30.3	1.09	22.05	0.565	20.84
35	8.52	0.179	47.6	1.029	22.29	0.7	341	2.45	9.09	0.959	48.75	27.2	0.127	0.709	N.A.	1.156	Y	1.071	22.1	4.3	31.5	1.09	23.00	0.560	19.73
36	8.66	0.179	48.4	1.023	22.17	0.7	341	2.45	9.24	0.976	50.26	28.3	0.127	0.713	N.A.	1.154	Y	1.086	20.9	4.4	32.7	1.08	23.97	0.556	18.66
37	8.80	0.179	49.2	1.017	22.04	0.7	341	2.45	9.40	0.992	51.80	29.4	0.127	0.718	N.A.	1.153	Y	1.100	19.7	4.5	33.9	1.07	24.95	0.551	17.62
38	8.94	0.179	50.0	1.011	21.90	0.7	341	2.45	9.55	1.010	53.36	30.5	0.127	0.721	N.A.	1.151	Y	1.115	18.6	4.6	35.1	1.07	25.96	0.546	16.61
39	9.08	0.179	50.7	1.005	21.77	0.7	341	2.45	9.70	1.027	54.94	31.6	0.127	0.725	N.A.	1.149	Y	1.130	17.5	4.7	36.3	1.06	26.97	0.541	15.63
40	9.22	0.179	51.5	0.998	21.63	0.7	341	2.45	9.85	1.044	56.54	32.8	0.127	0.729	N.A.	1.147	Y	1.145	16.4	4.8	37.6	1.06	28.01	0.536	14.69
41	9.36	0.179	52.3	0.992	21.49	0.7	341	2.45	10.01	1.062	58.17	33.9	0.127	0.732	N.A.	1.146	Y	1.160	15.4	4.9	38.9	1.05	29.06	0.531	13.78
42	9.50	0.179	53.1	0.985	21.34	0.7	341	2.45	10.16	1.080	59.82	35.1	0.128	0.735	N.A.	1.144	Y	1.176	14.4	5.0	40.1	1.04	30.13	0.526	12.90
43	9.64	0.179	53.9	0.978	21.19	0.7	341	2.45	10.31	1.099	61.49	36.3	0.128	0.738	N.A.	1.142	Y	1.191	13.4	5.2	41.4	1.04	31.22	0.521	12.05
44	9.78	0.179	54.7	0.971	21.04	0.7	341	2.45	10.46	1.117	63.18	37.5	0.128	0.740	N.A.	1.140	Y	1.206	12.5	5.3	42.7	1.03	32.33	0.517	11.24
45	9.92	0.179	55.4	0.964	20.88	0.7	341	2.45	10.62	1.136	64.90	38.7	0.128	0.743	N.A.	1.138	Y	1.222	11.6	5.4	44.0	1.03	33.46	0.512	10.45
46	10.06	0.179	56.2	0.956	20.72	0.7	341	2.45	10.77	1.155	66.64	39.9	0.129	0.745	N.A.	1.137	Y	1.238	10.8	5.5	45.4	1.02	34.60	0.507	9.69
47	10.20	0.179	57.0	0.948	20.55	0.7	341	2.45	10.92	1.175	68.40	41.2	0.129	0.747	N.A.	1.135	Y	1.254	10.0	5.5	46.7	1.02	35.77	0.503	8.97
48	10.34	0.179	57.8	0.940	20.38	0.7	341	2.45	11.07	1.195	70.19	42.4	0.129	0.749	N.A.	1.133	Y	1.269	9.2	5.6	48.1	1.01	36.95	0.498	8.27
49	10.48	0.179	58.6	0.932	20.20	0.7	341	2.45	11.23	1.215	72.00	43.7	0.130	0.751											

51	10.90	0.179	60.1	0.915	19.82	0.7	341	2.45	11.53	1.255	75.68	46.3	0.131	0.755	N.A.	1.127	Y	1.318	7.1	5.9	52.2	1.00	40.63	0.481	6.37
52	10.90	0.179	60.9	0.906	19.62	0.7	341	2.45	11.68	1.276	77.56	47.6	0.131	0.757	N.A.	1.126	Y	1.334	6.4	6.0	53.6	1.00	41.89	0.481	5.79
53	11.04	0.179	61.7	0.896	19.41	0.7	341	2.45	11.84	1.297	79.46	49.0	0.132	0.758	N.A.	1.124	Y	1.350	5.8	6.1	55.0	0.99	43.18	0.477	5.24
54	11.18	0.179	62.5	0.886	19.20	0.7	341	2.45	11.99	1.319	81.38	50.3	0.132	0.760	N.A.	1.122	Y	1.366	5.2	6.1	56.5	0.99	44.49	0.473	4.72
55	11.32	0.179	63.3	0.876	18.97	0.7	341	2.45	12.14	1.340	83.32	51.7	0.132	0.761	N.A.	1.120	Y	1.382	4.7	6.2	57.9	0.98	45.82	0.469	4.23
56	11.46	0.179	64.0	0.865	18.74	0.7	341	2.45	12.29	1.362	85.29	53.1	0.133	0.763	N.A.	1.118	Y	1.398	4.2	6.3	59.4	0.98	47.17	0.465	3.77
57	11.60	0.179	64.8	0.853	18.49	0.7	341	2.45	12.45	1.384	87.28	54.5	0.133	0.764	N.A.	1.117	Y	1.415	3.7	6.4	60.8	0.98	48.54	0.461	3.33
58	11.74	0.179	65.6	0.849	18.39	0.7	341	2.45	12.60	1.472	89.29	56.0	0.140	0.769	N.A.	1.115	Y	1.492	3.2	6.4	62.4	0.97	49.94	0.458	2.92
59	11.88	0.179	66.4	0.849	18.39	0.7	341	2.45	12.75	1.494	91.33	57.5	0.141	0.770	N.A.	1.113	Y	1.509	2.8	6.5	63.9	0.97	51.42	0.454	2.54
60	12.02	0.179	67.2	0.849	18.39	0.7	341	2.45	12.90	1.517	93.39	59.0	0.141	0.772	N.A.	1.111	Y	1.526	2.4	6.5	65.5	0.96	52.92	0.451	2.19
61	12.16	0.179	68.0	0.849	18.39	0.7	341	2.45	13.06	1.680	95.47	60.6	0.154	0.782	N.A.	1.109	Y	1.822	2.1	6.6	67.2	0.96	54.45	0.449	1.86
62	12.30	0.179	68.7	0.849	18.39	0.7	341	2.45	13.21	1.704	97.57	62.5	0.155	0.786	N.A.	1.107	Y	1.840	1.7	6.7	69.1	0.96	56.15	0.447	1.56
63	12.44	0.179	69.5	0.849	18.39	0.7	341	2.45	13.36	1.728	99.70	64.3	0.155	0.790	N.A.	1.104	Y	1.857	1.4	6.7	71.0	0.95	57.86	0.445	1.29
64	12.58	0.179	70.3	0.849	18.39	0.7	341	2.45	13.51	1.752	101.85	66.2	0.156	0.794	N.A.	1.102	Y	1.874	1.1	6.8	72.9	0.95	59.60	0.443	1.04
65	12.72	0.179	71.1	0.849	18.39	0.7	341	2.45	13.67	1.776	104.02	68.1	0.156	0.798	N.A.	1.100	Y	1.892	0.9	6.8	74.9	0.95	61.36	0.441	0.82
66	12.86	0.179	71.9	0.849	18.39	0.7	341	2.45	13.82	1.800	106.21	70.0	0.156	0.801	N.A.	1.098	Y	1.910	0.7	6.8	76.8	0.95	63.15	0.439	0.63
67	13.00	0.179	72.6	0.849	18.39	0.7	341	2.45	13.97	1.825	108.43	71.9	0.157	0.805	N.A.	1.096	Y	1.928	0.5	6.9	78.8	0.94	64.96	0.437	0.46
68	13.14	0.179	73.4	0.849	18.39	0.7	341	2.45	14.12	1.850	110.67	73.8	0.157	0.808	N.A.	1.093	Y	1.946	0.4	6.9	80.7	0.94	66.80	0.435	0.32
69	13.28	0.179	74.2	0.849	18.39	0.7	341	2.45	14.28	1.876	112.93	75.8	0.158	0.811	N.A.	1.091	Y	1.965	0.2	6.9	82.7	0.94	68.66	0.433	0.20
70	13.42	0.179	75.0	0.849	18.39	0.7	341	2.45	14.43	1.901	115.22	77.8	0.158	0.814	N.A.	1.089	Y	1.983	0.1	6.9	84.7	0.93	70.55	0.431	0.11
71	13.56	0.179	75.8	0.849	18.39	0.7	341	2.45	14.58	1.927	117.53	79.7	0.159	0.817	N.A.	1.087	NA	2.002	0.1	7.0	86.7	0.93	72.47	0.429	0.05
72	13.70	0.179	76.6	0.849	18.39	0.7	341	2.45	14.73	1.953	119.86	81.8	0.159	0.820	N.A.	1.085	NA	2.021	0.0	7.0	88.7	0.93	74.41	0.427	0.01
73	13.84	0.179	77.3	0.849	18.39	0.7	341	2.45	14.89	1.980	122.21	83.8	0.160	0.822	N.A.	1.083	NA	2.040	0.0	7.0	90.8	0.93	76.37	0.000	0.00



**Reference:** 2019 CBC, ASCE 7-16

**INPUT:**

Job Location:	Petaluma, CA		
Site Class	D		Per Soil Report
0.2 Sec MCE, S <sub>s</sub>	1.860	g	Per Soil Report
1.0 Sec MCE, S <sub>1</sub>	0.710	g	Per Soil Report
S <sub>MS</sub> = F <sub>a</sub> S <sub>s</sub>	1.700	g	Per Soil Report
S <sub>M1</sub> = F <sub>v</sub> S <sub>1</sub>	1.550	g	Per Soil Report
S <sub>DS</sub> = 2/3 S <sub>MS</sub>	1.133	g	Per Soil Report
S <sub>D1</sub> = 2/3 S <sub>M1</sub>	1.033	g	Per Soil Report
T <sub>s</sub> = S <sub>D1</sub> /S <sub>DS</sub>	0.912	sec	
Long Period transition period, T <sub>L</sub>	8.0	sec	ASCE 7-16 -Figure 22-12
Risk Category	II		Table 1604.5
Seismic Design Category	D		2019 CBC Section 1613.3.5

**OUTPUT:**

<b>Light Pole Class</b>	LS70-B		
Fundamental Period, T	2.79	sec	See structural calculations, pg 6
Seismic coeff., R	1.5		ASCE 7-16 Table 15.4-2
Overstrength Factor, Ω	1.5		ASCE 7-16 Table 15.4-2
Importance Factor, I	1.00		ASCE 7-16 Section 15.4.1.1 & Table 1.5-2
Redundancy factor, ρ	1.0		ASCE 7-16 Section 15.6
<b>DESIGN SEISMIC FORCE</b>			
V = C <sub>s</sub> W			ASCE 7-16 Eqn. 12.8-1
C <sub>s</sub> = S <sub>DS</sub> /(R/I) for T ≤ T <sub>s</sub>	0.756	g	ASCE 7-16 Eqn. 12.8-2
C <sub>s</sub> max. for T ≤ T <sub>L</sub> , C <sub>s</sub> = S <sub>D1</sub> /T(R/I)	0.247	g	ASCE 7-16 Eqn. 12.8-3
C <sub>s</sub> min = 0.044 S <sub>DS</sub>   ≥ 0.03	0.050	g	ASCE 7-16 Eqn. 15.4-1
if S <sub>1</sub> ≥ 0.6g, C <sub>s</sub> min = 0.8 S <sub>1</sub> /(R/I)	0.379	g	ASCE 7-16 Eqn. 15.4-2
Load Combination, 1.2D+ 1.0E			ASCE 7-16 Section 2.3.2 Load Comb 5
where E = E <sub>h</sub> + E <sub>v</sub>			ASCE 7-16 Eqn. 12.4-1
and E <sub>h</sub> = ρQ <sub>E</sub>	0.379	W	ASCE 7-16 Eqn. 12.4-3
and E <sub>v</sub> = 0.2 S <sub>DS</sub> D	0.227	D	ASCE 7-16 Eqn. 12.4-4
Load Combination, 1.2D + (ρQ <sub>E</sub> + 0.2 S <sub>DS</sub> D)			
Load Combination, 1.2D + (ρQ <sub>E</sub> + 0.2 S <sub>DS</sub> D)	1.427	D	+ 0.379 W

Total Seismic Weight, W = 2.504 kips See following page

SEISMIC SHEAR, V = 1.150 kips < 2.029 kips WIND SHEAR

WIND CONTROLS

Vertical Distribution of Seismic Force,  $F_x = \frac{C_{vx}V}{k}$  ASCE7-16 Eqn. 12.8-11 & Section 12.8.5  
 $k = 2.000$

Item	w	$h_x$	$w_x h_x^k$	$w_x h_x^k / \sum w_x h_x^k$	$C_{vx} * V$	OTM
fixtures	0.464	70.5	2306	0.557	0.528	37.22
			0	0.000	0.000	0.00
			0	0.000	0.000	0.00
			0	0.000	0.000	0.00
Top Pole Section	0.034	68.5	160	0.039	0.037	2.50
2nd Pole Section	0.357	53.25	1012	0.244	0.232	12.34
1st Pole Section	0.839	22	406	0.098	0.093	2.05
			0	0.000	0.000	0.00
			0	0.000	0.000	0.00
			0	0.000	0.000	0.00
LED400	0.071	50.00	178	0.043	0.041	2.03
LED575	0.065	15.00	15	0.004	0.003	0.05
ECE	0.140	15.00	32	0.008	0.007	0.11
1/2 Precast base above grade	0.534	8.00	34	0.008	0.008	0.06
Sum	2.504		4142	1.000	0.948	56.36
Total Dead Load at grade	3.038					

SEISMIC OTM = 56.36 kip-ft < 89.52 kip-ft Wind OTM WIND CONTROLS

**SCOPE:** Analysis of an annular prestressed concrete pole member based on compatible strain procedure per ACI-318-11 with an ultimate concrete strain of 0.003.  
**PROJECT:** Musco Standard Pole Base  
**DATE:** May-14-2014 9:49 AM  
**POLE TYPE =** 3B

PROGRAM VERSION 2.3 Standard

**USER DEFINED INPUTS**

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CROSS-SECTION OUTER DIAMTER = $D_o =$	<b>13.32</b> INCHES
HOLLOW CORE INSIDE DIAMETER = $D_i =$	<b>6.125</b> INCHES
TENDON CIRCLE DIAMETER = $D_t =$	<b>10.32</b> INCHES
NUMBER OF TENDONS = N (56 or less and even)	<b>12</b>
TENDON DIAMETER = $d_t =$	<b>0.5</b> INCHES
NOMINAL TENDON AREA = $A_{ps} =$	<b>0.1531</b> IN <sup>2</sup>
ULTIMATE TENDON STRENGTH = $f_{pu} =$	<b>270</b> KSI
TENDON YIELD STRENGTH = $f_{py} =$	<b>230</b> KSI
CONCRETE COMPRESSIVE STRENGTH = $F'_c =$	<b>9500</b> PSI
MODULUS OF ELASTICITY - STEEL = $E_s =$	<b>29000</b> KSI
INITIAL PRESTRESS FACTOR = IPF =	<b>0.64</b>
PRESTRESS LOSS FACTOR = PLF =	<b>0.82</b>
*PHI FACTOR USED =	<b>0.9</b>

**OUTPUT**

---

PHI FACTOR = $\phi =$	0.90	
PRESTRESSING STRAIN IN TENDON = $\epsilon_{se} =$	0.0049	
CONCRETE SERVICE STRESS DUE TO PRESTRESS =	2369 PSI	
CROSS SECTIONAL AREA =	110 IN <sup>2</sup>	
GROSS MOMENT OF INERTIA =	1476 IN <sup>4</sup>	
DISTANCE TO NEUTRAL AXIS FROM COMP. SIDE = $c =$	6.15 INCHES	
CONCRETE COMPRESSIVE FORCE =	274 KIPS	
AREA OF BONDED REINFORCEMENT =	1.84 IN <sup>2</sup>	
MINIMUM BONDED REINFORCEMENT AREA =	0.22 IN <sup>2</sup>	<b>SATISFIED</b>
REINFORCEMENT RATIO = $\rho_p =$	0.0207	
REINFORCEMENT INDEX = $\omega =$	0.3756	
MAXIMUM REINFORCEMENT INDEX =	0.2340	<b>EXCEEDED</b>
STRAND DEVELOPMENT LENGTH = $L_d =$	64 INCHES	

**RESULTS**

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NOMINAL MOMENT CAPACITY = $M_n =$	128 FT-KIPS	
DESIGN MOMENT CAPACITY = $\phi M_n =$	<b>115</b> FT-KIPS	
CRACKING LOAD MOMENT =	57 FT-KIPS	<b>SATISFIED</b>

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Distance from top of Pole FT	Outside Diameter of Pole, D IN	Pole thick,t IN	D/t	Kz	qz PSF	Cf Pole	kl/r equiv.	E3-4 Fe	E3-2 or E3-3 Design comp strength, P KIPS	Acting Manufactored, P KIPS	F8.1-F8.4 Design flex strength, M K-FT	Req'd flex strength, N K-FT	Pr/Pc	H1-lb for Pr/Pc < 0.2	H1-la for Pr/Pc ≥ 0.2	2nd Order /1st Order Moment FT-K	Req'd shea Delta KIPS	1st Order Delta IN	C2.2a P-Delta Moment FT-K	Total 2nd Order Moment FT-K	E7-19 Q	ACTING MOM DUE TO DL	M/I	DEFL DUE TO DL IN	
0	7.00	0.125	56.0	1.180	25.57	0.7	291	3.37	7.19	0.000	16.71	0.0	0.000	0.000	N.A.	1.000	Y	0.000	53.3	0.0	0.0	1.185	0.00	0.000	54.22
1	7.00	0.125	56.0	1.177	25.49	0.7	291	3.37	7.19	0.730	16.71	0.4	0.122	0.089	N.A.	1.269	Y	0.728	51.9	0.1	0.5	1.185	0.00	0.023	52.88
2	7.00	0.125	56.0	1.173	25.42	0.7	291	3.37	7.19	0.739	16.71	1.1	0.123	0.139	N.A.	1.179	Y	0.741	50.6	0.2	1.3	1.185	0.74	0.070	51.54
3	7.00	0.125	56.0	1.170	25.34	0.7	291	3.37	7.19	0.749	16.71	1.8	0.125	0.191	N.A.	1.161	Y	0.754	49.3	0.3	2.1	1.185	1.48	0.117	50.20
4	7.00	0.125	56.0	1.166	25.26	0.7	291	3.37	7.19	0.758	16.71	2.6	0.126	0.243	N.A.	1.153	Y	0.767	47.9	0.4	3.0	1.185	2.24	0.164	48.86
5	7.00	0.125	56.0	1.162	25.18	0.7	291	3.37	7.19	0.771	16.71	3.4	0.129	0.296	N.A.	1.148	Y	0.779	46.6	0.5	3.9	1.185	3.00	0.167	47.54
6	7.36	0.179	41.1	1.159	25.10	0.7	291	3.37	10.75	0.785	37.03	4.2	0.088	0.173	N.A.	1.145	Y	0.793	45.3	0.6	4.8	1.154	3.78	0.155	46.22
7	7.50	0.179	41.9	1.155	25.02	0.7	291	3.37	10.96	0.800	38.35	5.0	0.088	0.192	N.A.	1.142	Y	0.806	44.0	0.7	5.7	1.145	4.57	0.175	44.91
8	7.64	0.179	42.7	1.151	24.94	0.7	291	3.37	11.17	0.814	39.70	5.8	0.087	0.210	N.A.	1.140	Y	0.820	42.7	0.8	6.6	1.136	5.38	0.193	43.62
9	7.78	0.179	43.4	1.147	24.86	0.7	291	3.37	11.38	0.829	41.07	6.6	0.087	0.227	N.A.	1.139	Y	0.834	41.4	0.9	7.5	1.128	6.20	0.208	42.33
10	7.92	0.179	44.2	1.143	24.77	0.7	291	3.37	11.59	0.844	42.46	7.4	0.087	0.243	N.A.	1.138	Y	0.848	40.2	1.0	8.5	1.12	7.03	0.223	41.06
11	8.06	0.179	45.0	1.139	24.69	0.7	291	3.37	11.80	0.860	43.87	8.3	0.087	0.259	N.A.	1.136	Y	0.862	38.9	1.1	9.4	1.112	7.89	0.235	39.80
12	8.20	0.179	45.8	1.135	24.60	0.7	291	3.37	12.01	0.875	45.31	9.2	0.087	0.273	N.A.	1.135	Y	0.877	37.7	1.2	10.4	1.104	8.75	0.247	38.55
13	8.34	0.179	46.6	1.131	24.52	0.7	291	3.37	12.22	0.891	46.77	10.1	0.087	0.288	N.A.	1.134	Y	0.891	36.5	1.3	11.4	1.097	9.64	0.257	37.32
14	8.48	0.179	47.4	1.127	24.43	0.7	291	3.37	12.43	0.907	48.25	11.0	0.088	0.301	N.A.	1.133	Y	0.906	35.3	1.5	12.4	1.09	10.54	0.267	36.10
15	8.62	0.179	48.1	1.123	24.34	0.7	291	3.37	12.64	0.924	49.75	11.9	0.088	0.314	N.A.	1.132	Y	0.921	34.1	1.6	13.4	1.083	11.45	0.275	34.90
16	8.76	0.179	48.9	1.119	24.25	0.7	291	3.37	12.85	0.940	51.28	12.8	0.088	0.326	N.A.	1.131	Y	0.937	32.9	1.7	14.5	1.076	12.38	0.283	33.72
17	8.90	0.179	49.7	1.115	24.15	0.7	291	3.37	13.06	0.957	52.83	13.7	0.088	0.338	N.A.	1.130	Y	0.952	31.7	1.8	15.5	1.07	13.33	0.289	32.55
18	9.04	0.179	50.5	1.110	24.06	0.7	291	3.37	13.27	0.974	54.41	14.7	0.088	0.349	N.A.	1.129	Y	0.968	30.6	1.9	16.6	1.064	14.30	0.295	31.39
19	9.18	0.179	51.3	1.106	23.97	0.7	291	3.37	13.48	0.992	56.00	15.7	0.088	0.360	N.A.	1.128	Y	0.984	29.5	2.0	17.7	1.057	15.28	0.301	30.26
20	9.32	0.179	52.1	1.102	23.87	0.7	291	3.37	13.69	1.010	57.62	16.7	0.089	0.370	N.A.	1.127	Y	1.000	28.4	2.1	18.8	1.052	16.28	0.306	29.14
21	9.46	0.179	52.8	1.097	23.77	0.7	291	3.37	13.90	1.028	59.26	17.7	0.089	0.380	N.A.	1.126	Y	1.016	27.3	2.2	19.9	1.046	17.30	0.310	28.04
22	9.60	0.179	53.6	1.092	23.67	0.7	291	3.37	14.11	1.046	60.93	18.7	0.089	0.390	N.A.	1.125	Y	1.032	26.2	2.3	21.0	1.04	18.34	0.314	26.96
23	9.74	0.179	54.4	1.088	23.57	0.7	291	3.37	14.32	1.065	62.61	19.7	0.089	0.399	N.A.	1.124	Y	1.049	25.2	2.5	22.2	1.035	19.39	0.317	25.90
24	9.88	0.179	55.2	1.083	23.47	0.7	291	3.37	14.53	1.083	64.32	20.8	0.089	0.408	N.A.	1.123	Y	1.066	24.2	2.6	23.4	1.03	20.46	0.321	24.86
25	10.02	0.179	56.0	1.078	23.36	0.7	291	3.37	14.74	1.102	66.05	21.9	0.090	0.417	N.A.	1.122	Y	1.083	23.2	2.7	24.5	1.025	21.56	0.323	23.84
26	10.16	0.179	56.7	1.073	23.26	0.7	291	3.37	14.95	1.122	67.81	23.0	0.090	0.425	N.A.	1.121	Y	1.100	22.2	2.8	25.7	1.02	22.67	0.326	22.83
27	10.30	0.179	57.5	1.068	23.15	0.7	291	3.37	15.16	1.141	69.59	24.1	0.090	0.433	N.A.	1.120	Y	1.117	21.2	2.9	27.0	1.015	23.80	0.328	21.85
28	10.44	0.179	58.3	1.063	23.04	0.7	291	3.37	15.37	1.161	71.39	25.2	0.091	0.440	N.A.	1.119	Y	1.134	20.3	3.0	28.2	1.01	24.95	0.330	20.88
29	10.58	0.179	59.1	1.058	22.93	0.7	291	3.37	15.58	1.182	73.21	26.3	0.091	0.448	N.A.	1.118	Y	1.152	19.3	3.1	29.5	1.006	26.12	0.331	19.93
30	10.72	0.179	59.9	1.053	22.81	0.7	291	3.37	15.79	1.201	75.06	27.5	0.091	0.455	N.A.	1.117	Y	1.169	18.4	3.2	30.7	1.001	27.31	0.355	19.01
31	10.42	0.179	58.2	1.048	22.70	0.7	291	3.37	15.34	1.221	71.18	28.7	0.096	0.497	N.A.	1.116	Y	1.187	17.5	3.3	32.0	1.011	28.53	0.378	18.10
32	10.56	0.179	59.0	1.042	22.58	0.7	291	3.37	15.55	1.241	73.00	29.9	0.096	0.504	N.A.	1.115	Y	1.204	16.7	3.4	33.3	1.006	29.76	0.378	17.22
33	10.70	0.179	59.8	1.036	22.46	0.7	291	3.37	15.76	1.262	74.84	31.1	0.096	0.511	N.A.	1.114	Y	1.221	15.8	3.5	34.6	1.002	31.01	0.379	16.35
34	10.84	0.179	60.6	1.031	22.33	0.7	291	3.37	15.97	1.282	76.71	32.3	0.096	0.517	N.A.	1.113	Y	1.239	15.0	3.7	36.0	0.997	32.28	0.379	15.51
35	10.98	0.179	61.3	1.025	22.21	0.7	291	3.37	16.18	1.303	78.60	33.6	0.097	0.523	N.A.	1.112	Y	1.257	14.2	3.8	37.3	0.993	33.57	0.379	14.70
36	11.12	0.179	62.1	1.019	22.08	0.7	291	3.37	16.39	1.324	80.51	34.8	0.097	0.529	N.A.	1.111	Y	1.274	13.5	3.9	38.7	0.989	34.89	0.379	13.90
37	11.26	0.179	62.9	1.013	21.95	0.7	291	3.37	16.60	1.346	82.44	36.1	0.097	0.535	N.A.	1.110	Y	1.292	12.7	4.0	40.1	0.985	36.22	0.378	13.13
38	11.40	0.179	63.7	1.007	21.81	0.7	291	3.37	16.81	1.368	84.40	37.4	0.098	0.540	N.A.	1.109	Y	1.310	12.0	4.1	41.5	0.981	37.58	0.378	12.38
39	11.54	0.179	64.5	1.000	21.68	0.7	291	3.37	17.02	1.390	86.38	38.7	0.098	0.546	N.A.	1.107	Y	1.328	11.3	4.2	42.9	0.977	38.96	0.377	11.66
40	11.68	0.179	65.3	0.994	21.53	0.7	291	3.37	17.23	1.412	88.38	40.1	0.098	0.551	N.A.	1.106	Y	1.346	10.6	4.3	44.3	0.974	40.36	0.377	10.95
41	11.82	0.179	66.0	0.987	21.39	0.7	291	3.37	17.44	1.434	90.41	41.4	0.099	0.556	N.A.	1.105	Y	1.365	9.9	4.3	45.8	0.97	41.78	0.376	10.27
42	11.96	0.179	66.8	0.980	21.24	0.7	291	3.37	17.65	1.457	92.46	42.8	0.099	0.561	N.A.	1.104	Y	1.383	9.3	4.4	47.2	0.967	43.22	0.376	9.61
43	12.10	0.179	67.6	0.973	21.09	0.7	291	3.37	17.86	1.480	94.53	44.2	0.099	0.565	N.A.	1.103	Y	1.401	8.7	4.5	48.7	0.963	44.69	0.375	8.97
44	12.24	0.179	68.4	0.966	20.93	0.7	291	3.37	18.07	1.504	96.62	45.6	0.100	0.570	N.A.	1.101	Y	1.420	8.1	4.6	50.2	0.96	46.19	0.374	8.36
45	12.38	0.179	69.2	0.959	20.77	0.7	291	3.37	18.28	1.527	98.74	47.0	0.100	0.574	N.A.	1.100	Y	1.439	7.5	4.7	51.7	0.956	47.70	0.373	7.77
46	12.52	0.179	69.9	0.951	20.60	0.7	291	3.37	18.49	1.551	100.88	48.5	0.101	0.578	N.A.	1.099	Y	1.457	6.9	4.8	53.3	0.953	49.24	0.372	7.20
47	12.66	0.179	70.7	0.943	20.43	0.7	291	3.37	18.70	1.575	103.04	49.9	0.101	0.583	N.A.	1.098	Y	1.476	6.4	4.9	54.8	0.95	50.80	0.371	6.65
48	12.80	0.179	71.5	0.935	20.26	0.7	291	3.37	18.91	1.600	105.22	51.4	0.102	0.587	N.A.	1.096	Y	1.495	5.9	5.0	56.4	0.947	52.39	0.370	6.12
49	12.94	0.179	72.3	0.926	20.07	0.7	291	3.37	19.12	1.624	107.43	52.9													

51	13.22	5/3/2021	0.179	73.9	0.909	19.69	0.7	291	3.37	19.54	1.675	111.91	56.0	0.103	0.598	N.A.	1.093	Y	1.551	4.5	5.2	61.2	0.938	57.30	0.367	4.57	1.578	LS70-C Wind B1
52	13.36		0.179	74.6	0.899	19.48	0.7	291	3.37	19.75	1.700	114.19	57.6	0.103	0.602	N.A.	1.091	Y	1.570	4.1	5.3	62.8	0.935	58.99	0.366	4.24		
53	13.50		0.179	75.4	0.889	19.27	0.7	291	3.37	19.96	1.726	116.49	59.1	0.104	0.605	N.A.	1.090	Y	1.589	3.7	5.3	64.5	0.932	60.70	0.365	3.83		
54	13.64		0.179	76.2	0.879	19.05	0.7	291	3.37	20.17	1.752	118.81	60.7	0.104	0.609	N.A.	1.089	Y	1.608	3.3	5.4	66.1	0.93	62.44	0.363	3.43		
55	13.78		0.179	77.0	0.869	18.82	0.7	291	3.37	20.38	1.778	121.15	62.4	0.105	0.612	N.A.	1.088	Y	1.626	2.9	5.5	67.8	0.927	64.20	0.362	3.06		
56	13.92		0.179	77.8	0.857	18.58	0.7	291	3.37	20.58	1.805	123.52	64.0	0.105	0.615	N.A.	1.086	Y	1.645	2.6	5.5	69.5	0.924	65.99	0.361	2.71		
57	14.06		0.179	78.6	0.849	18.39	0.7	291	3.37	20.79	1.897	125.91	65.7	0.109	0.621	N.A.	1.085	Y	1.723	2.3	5.6	71.3	0.922	67.81	0.360	2.38		
58	14.20		0.179	79.3	0.849	18.39	0.7	291	3.37	21.00	1.924	128.32	67.4	0.110	0.624	N.A.	1.084	Y	1.742	2.0	5.6	73.0	0.919	69.72	0.359	2.07		
59	14.34		0.179	80.1	0.849	18.39	0.7	291	3.37	21.21	1.951	130.75	69.2	0.110	0.628	N.A.	1.082	Y	1.761	1.7	5.7	74.9	0.917	71.66	0.358	1.79		
60	14.48		0.179	80.9	0.849	18.39	0.7	291	3.37	21.42	1.979	133.21	70.9	0.111	0.631	N.A.	1.081	Y	1.780	1.5	5.7	76.7	0.914	73.62	0.358	1.52		
61	14.62		0.179	81.7	0.849	18.39	0.7	291	3.37	21.63	2.167	135.69	72.9	0.120	0.640	N.A.	1.080	Y	2.068	1.2	5.8	78.6	0.912	75.62	0.357	1.28		
62	14.76		0.179	82.5	0.849	18.39	0.7	291	3.37	21.84	2.195	138.19	74.9	0.121	0.645	N.A.	1.078	Y	2.087	1.0	5.8	80.8	0.91	77.80	0.357	1.06		
63	14.90		0.179	83.2	0.849	18.39	0.7	291	3.37	22.05	2.223	140.72	77.0	0.121	0.650	N.A.	1.076	Y	2.107	0.8	5.9	82.9	0.907	80.01	0.357	0.85		
64	15.04		0.179	84.0	0.849	18.39	0.7	291	3.37	22.26	2.252	143.27	79.1	0.121	0.654	N.A.	1.075	Y	2.127	0.6	5.9	85.1	0.905	82.24	0.356	0.68		
65	15.18		0.179	84.8	0.849	18.39	0.7	291	3.37	22.47	2.281	145.84	81.3	0.122	0.659	N.A.	1.073	Y	2.147	0.5	6.0	87.2	0.903	84.51	0.356	0.52		
66	15.32		0.179	85.6	0.849	18.39	0.7	291	3.37	22.68	2.310	148.43	83.4	0.122	0.664	N.A.	1.072	Y	2.168	0.4	6.0	89.4	0.901	86.81	0.355	0.38		
67	15.46		0.179	86.4	0.849	18.39	0.7	291	3.37	22.89	2.340	151.05	85.6	0.123	0.668	N.A.	1.070	Y	2.188	0.3	6.0	91.6	0.899	89.13	0.355	0.26		
68	15.60		0.179	87.2	0.849	18.39	0.7	291	3.37	23.10	2.369	153.69	87.8	0.123	0.672	N.A.	1.069	Y	2.209	0.2	6.0	93.9	0.897	91.48	0.355	0.17		
69	15.74		0.179	87.9	0.849	18.39	0.7	291	3.37	23.31	2.399	156.35	90.0	0.124	0.676	N.A.	1.067	Y	2.230	0.1	6.1	96.1	0.895	93.87	0.354	0.09		
70	15.88		0.179	88.7	0.849	18.39	0.7	291	3.37	23.52	2.430	159.03	92.3	0.124	0.680	N.A.	1.066	NA	2.251	0.0	6.1	98.3	0.893	96.28	0.353	0.04		
71	16.02		0.179	89.5	0.849	18.39	0.7	291	3.37	23.73	2.460	161.74	94.5	0.124	0.684	N.A.	1.064	NA	2.272	0.0	6.1	100.6	0.891	98.73	0.353	0.01		
72	16.16		0.179	90.3	0.849	18.39	0.7	291	3.37	23.94	2.491	164.47	96.8	0.125	0.688	N.A.	1.063	NA	2.294	0.0	6.1	102.9	0.889	101.20	0.000	0.00		

**Reference:** 2019 CBC, ASCE 7-16

**INPUT:**

Job Location:	Petaluma, CA		
Site Class	D		Per Soil Report
0.2 Sec MCE, S <sub>s</sub>	1.860	g	Per Soil Report
1.0 Sec MCE, S <sub>1</sub>	0.710	g	Per Soil Report
S <sub>MS</sub> = F <sub>a</sub> S <sub>s</sub>	1.700	g	Per Soil Report
S <sub>M1</sub> = F <sub>v</sub> S <sub>1</sub>	1.550	g	Per Soil Report
S <sub>DS</sub> = 2/3 S <sub>MS</sub>	1.133	g	Per Soil Report
S <sub>D1</sub> = 2/3 S <sub>M1</sub>	1.033	g	Per Soil Report
T <sub>s</sub> = S <sub>D1</sub> /S <sub>DS</sub>	0.912	sec	
Long Period transition period, T <sub>L</sub>	8.0	sec	ASCE 7-16 -Figure 22-12
Risk Category	II		Table 1604.5
Seismic Design Category	D		2019 CBC Section 1613.3.5

**OUTPUT:**

<b>Light Pole Class</b>	LS70-C		
Fundamental Period, T	2.35	sec	See structural calculations, pg 12
Seismic coeff., R	1.5		ASCE 7-16 Table 15.4-2
Overstrength Factor, Ω	1.5		ASCE 7-16 Table 15.4-2
Importance Factor, I	1.00		ASCE 7-16 Section 15.4.1.1 & Table 1.5-2
Redundancy factor, ρ	1.0		ASCE 7-16 Section 15.6
<b>DESIGN SEISMIC FORCE</b>			
V = C <sub>s</sub> W			ASCE 7-16 Eqn. 12.8-1
C <sub>s</sub> = S <sub>DS</sub> /(R/I) for T ≤ T <sub>s</sub>	0.756	g	ASCE 7-16 Eqn. 12.8-2
C <sub>s</sub> max. for T ≤ T <sub>L</sub> , C <sub>s</sub> = S <sub>D1</sub> /T(R/I)	0.293	g	ASCE 7-16 Eqn. 12.8-3
C <sub>s</sub> min = 0.044 S <sub>DS</sub>   ≥ 0.03	0.050	g	ASCE 7-16 Eqn. 15.4-1
if S <sub>1</sub> ≥ 0.6g, C <sub>s</sub> min = 0.8 S <sub>1</sub> /(R/I)	0.379	g	ASCE 7-16 Eqn. 15.4-2
Load Combination, 1.2D+ 1.0E			ASCE 7-16 Section 2.3.2 Load Comb 5
where E = E <sub>h</sub> + E <sub>v</sub>			ASCE 7-16 Eqn. 12.4-1
and E <sub>h</sub> = ρQ <sub>E</sub>	0.379	W	ASCE 7-16 Eqn. 12.4-3
and E <sub>v</sub> = 0.2 S <sub>DS</sub> D	0.227	D	ASCE 7-16 Eqn. 12.4-4
Load Combination, 1.2D + (ρQ <sub>E</sub> + 0.2 S <sub>DS</sub> D)			
Load Combination, 1.2D + (ρQ <sub>E</sub> + 0.2 S <sub>DS</sub> D)    1.427    D    +    0.379    W			

Total Seismic Weight, W = 3.201 kips See following page

SEISMIC SHEAR, V = 1.467 kips < 2.288 kips WIND SHEAR

WIND CONTROLS

Vertical Distribution of Seismic Force,  $F_x = \frac{C_{vx}V}{k}$  ASCE7-16 Eqn. 12.8-11 & Section 12.8.5  
 $k = 1.927$

Item	w	$h_x$	$w_x h_x^k$	$\frac{w_x h_x^k}{\sum w_x h_x^k}$	$C_{vx} * V$	OTM
fixtures	0.721	71.24	2685	0.598	0.724	51.61
			0	0.000	0.000	0.00
			0	0.000	0.000	0.00
			0	0.000	0.000	0.00
Top Pole Section	0.063	69.13	221	0.049	0.060	4.13
2nd Pole Section	0.491	54.20	1080	0.240	0.291	15.79
1st Pole Section	1.026	22.85	427	0.095	0.115	2.63
			0	0.000	0.000	0.00
			0	0.000	0.000	0.00
			0	0.000	0.000	0.00
			0	0.000	0.000	0.00
LED575	0.065	15.00	12	0.003	0.003	0.05
ECE	0.160	15.00	30	0.007	0.008	0.12
1/2 Precast base above grade	0.675	8.00	37	0.008	0.010	0.08
Sum	3.201		4492	1.000	1.212	74.41
Total Dead Load at grade	3.875					

SEISMIC OTM = 74.41 kip-ft < 102.26 kip-ft Wind OTM WIND CONTROLS



**SCOPE:** Analysis of an annular prestressed concrete pole member based on compatible strain procedure per ACI-318-11 with an ultimate concrete strain of 0.003.  
**PROJECT:** Musco Standard Pole Base  
**DATE:** May-14-2014 9:50 AM  
**POLE TYPE =** 4B

PROGRAM VERSION 2.3 Standard

**USER DEFINED INPUTS**

---

CROSS-SECTION OUTER DIAMETER = $D_o$ =	<b>15.67</b> INCHES
HOLLOW CORE INSIDE DIAMETER = $D_i$ =	<b>8.375</b> INCHES
TENDON CIRCLE DIAMETER = $D_t$ =	<b>12.625</b> INCHES
NUMBER OF TENDONS = N (56 or less and even)	<b>12</b>
TENDON DIAMETER = $d_t$ =	<b>0.5</b> INCHES
NOMINAL TENDON AREA = $A_{ps}$ =	<b>0.1531</b> IN <sup>2</sup>
ULTIMATE TENDON STRENGTH = $f_{pu}$ =	<b>270</b> KSI
TENDON YIELD STRENGTH = $f_{py}$ =	<b>230</b> KSI
CONCRETE COMPRESSIVE STRENGTH = $F'_c$ =	<b>9500</b> PSI
MODULUS OF ELASTICITY - STEEL = $E_s$ =	<b>29000</b> KSI
INITIAL PRESTRESS FACTOR = IPF =	<b>0.64</b>
PRESTRESS LOSS FACTOR = PLF =	<b>0.82</b>
*PHI FACTOR USED =	<b>0.9</b>

**OUTPUT**

---

PHI FACTOR = $\phi$ =	0.90	
PRESTRESSING STRAIN IN TENDON = $\epsilon_{se}$ =	0.0049	
CONCRETE SERVICE STRESS DUE TO PRESTRESS =	1890 PSI	
CROSS SECTIONAL AREA =	138 IN <sup>2</sup>	
GROSS MOMENT OF INERTIA =	2718 IN <sup>4</sup>	
DISTANCE TO NEUTRAL AXIS FROM COMP. SIDE = $c$ =	6.06 INCHES	
CONCRETE COMPRESSIVE FORCE =	298 KIPS	
AREA OF BONDED REINFORCEMENT =	1.84 IN <sup>2</sup>	
MINIMUM BONDED REINFORCEMENT AREA =	0.28 IN <sup>2</sup>	<b>SATISFIED</b>
REINFORCEMENT RATIO = $\rho_p$ =	0.0166	
REINFORCEMENT INDEX = $\omega$ =	0.3345	
MAXIMUM REINFORCEMENT INDEX =	0.2340	<b>EXCEEDED</b>
STRAND DEVELOPMENT LENGTH = $L_d$ =	68 INCHES	

**RESULTS**

---

NOMINAL MOMENT CAPACITY = $M_n$ =	177 FT-KIPS	
DESIGN MOMENT CAPACITY = $\phi M_n$ =	<b>159</b> FT-KIPS	
CRACKING LOAD MOMENT =	76 FT-KIPS	<b>SATISFIED</b>

CONFIDENTIAL: The information contained in this design is proprietary to The Cretex Companies, Inc. and is being furnished for the use of the designer in connection with this particular project. The information contained herein is not to be transmitted to any other organization unless specifically authorized in writing by The Cretex Companies, Inc.

DESIGN OF EMBEDDED POLE FOOTING-  
NONCONSTRAINED  
2019 CBC Section 1807.3.2.1

KNA STRUCTURAL ENGINEERS

Mark/Type	LS70-A	LS70-B	LS70-C
Grade	A1	A2	B1
<u>INPUT</u>			
Shear, P	lbs = 1,184	1,217	1,373
height of P above grade, h	ft = 43.0	46.1	46.7
allow lateral brg pressure, s	psf/ft = 300	300	300
max allow lateral brg pressure	psf/ft = 3000	3000	3000
Pier Diameter, b*	ft = 5.0	5.0	5.0
*Eff. Width of 2*pier diameter			
<u>OUTPUT</u>			
Moment at grade, M	ft-lbs = 50,934	56,146	64,099
acting lateral brg pressure, S <sub>1</sub>	psf = 667	688	720
allow lateral brg pressure, S	psf = 667	688	720
A=2.34P/(S <sub>1</sub> b)	= 0.83	0.83	0.89
Min req'd embedment, d	ft = 6.67	6.88	7.20
=A/2{1+(1+4.36h/A) <sup>1/2</sup> }			
Add Depth to Ignore	2.00	2.00	2.00
Total Embed Required	8.67	8.88	9.20
USE 30 IN DIAMETER --->	12'-0		
USE 30 IN DIAMETER --->		12'-0	
USE 30 IN DIAMETER --->			14'-0

**APPENDIX A**

**Search Information**

**Coordinates:** 38.264751888426964, -122.60824369664664  
**Elevation:** 109 ft  
**Timestamp:** 2021-04-29T18:51:31.856Z  
**Hazard Type:** Wind



**ASCE 7-16**

MRI 10-Year ..... 63 mph  
 MRI 25-Year ..... 70 mph  
 MRI 50-Year ..... 74 mph  
 MRI 100-Year ..... 78 mph  
 Risk Category I ..... 86 mph  
 Risk Category II ..... 92 mph  
 Risk Category III ..... 98 mph  
 Risk Category IV ..... 102 mph

**ASCE 7-10**

MRI 10-Year ..... 72 mph  
 MRI 25-Year ..... 79 mph  
 MRI 50-Year ..... 85 mph  
 MRI 100-Year ..... 91 mph  
 Risk Category I ..... 100 mph  
 Risk Category II ..... 110 mph  
 Risk Category III-IV ..... 115 mph

**ASCE 7-05**

ASCE 7-05 Wind Speed ..... 85 mph

*The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.*

**Disclaimer**

Hazard loads are interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer. Per ASCE 7, islands and coastal areas outside the last contour should use the last wind speed contour of the coastal area – in some cases, this website will extrapolate past the last wind speed contour and therefore, provide a wind speed that is slightly higher. NOTE: For queries near wind-borne debris region boundaries, the resulting determination is sensitive to rounding which may affect whether or not it is considered to be within a wind-borne debris region.

Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

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Spectrum, as shown on Figure 5.

Per ASCE 7-16 Section 21.4, the  $MCE_R$  spectral response acceleration parameters shall be taken from the Site-Specific Spectrum defined as follows and are presented on Figure 5 and summarized on Table A:

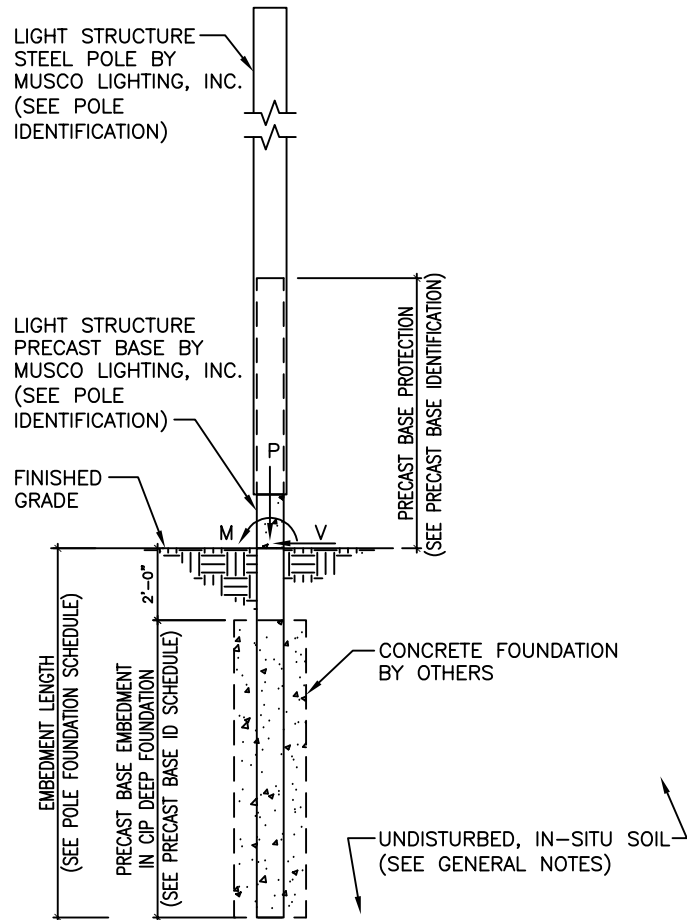
- $S_{DS}$  – The  $S_{DS}$  parameter shall be taken as 90% of the maximum spectral acceleration,  $S_a$ , obtained from the site-specific spectrum, at any period between 0.2 and 5.0-seconds. However, the values obtained shall not be less than 80% of the values determined in accordance with ASCE 7-16 Section 11.4.5.
- $S_{D1}$  – The  $S_{D1}$  parameter shall be taken as the maximum value of the product,  $TS_a$ , for periods between 1.0 and 2.0-seconds for Site Class C and B sites; and periods between 1.0 and 5.0-seconds for Site Class D, E & F sites. However, the values obtained shall not be less than 80% of the values determined in accordance with ASCE 7-16 Section 11.4.5.
- $S_{MS}$  – The  $S_{MS}$  parameter is equal to 1.5 times the  $S_{DS}$  value, but not less than 80% of the values determined in accordance with ASCE 7-16 Section 11.4.4.
- $S_{M1}$  – The  $S_{M1}$  parameter is equal to 1.5 times the  $S_{D1}$  value, but not less than 80% of the values determined in accordance with ASCE 7-16 Section 11.4.4.

**TABLE A**  
**ASCE 7-16 SEISMIC PARAMETERS**  
East Washington Park – Phase 2  
Petaluma, California

<u>Factor Name</u>	<u>Coefficient</u>	<u>ASCE 7-16 Site Specific Value</u>
Site Class <sup>1</sup>	$S_{A,B,C,D,E, \text{ or } F}$	$S_D$
Spectral Acc. (short)	$S_S$	1.86 g
Spectral Acc. (1-sec)	$S_1$	0.71 g
Spectral Response (short)	$SM_S$	1.70 g
Spectral Response (1-sec)	$SM_1$	1.55 g
Design Spectral Response (short)	$SD_S$	1.13 g
Design Spectral Response (1-sec)	$SD_1$	1.03 g
$MCE_G^2$ PGA adjusted for Site Class	$PGA_M$	0.86 g

Notes:

1. Site Class D Description: Stiff soil profile with shear wave velocities between 600 and 1,200 ft/sec, standard blow counts between 15 and 50 blows per foot, and undrained shear strength between 1,000 and 2,000 psf.
2. Maximum Considered Earthquake Geometric Mean.



LIGHT POLE FOUNDATION DETAIL  
SCALE: NO SCALE

**POLE AUXILIARY ATTACHMENTS**

LOCATION MARK	ATTACHMENT TYPE & QUANTITY	ATTACHMENT ELEVATION A.G.L. - FT
C1, C2	(2) LED1200	60
A1, A2	(1) LED400	50
A1, A2, B1, B2, D1, D2	(1) LED575	15
C1, C2	(2) LED575	15

POLE FOUNDATION SCHEDULE (SEE LIGHT POLE FOUNDATION DETAIL)					
TYPE	ASD GROUNDLINE FORCES (MAXIMUM)			C.I.P. DEEP FOUNDATION	
	MOMENT (M) KIP-FT	SHEAR (V) KIPS	VERTICAL (P) KIPS *	DIAMETER INCHES	EMBEDMENT FEET
LSS70-A	48.570	1.184	1.736	30"	12'-0"
LSS70-B	53.710	1.217	1.964	30"	12'-0"
LSS70-C	61.350	1.373	2.483	30"	14'-0"

\* VERTICAL FORCE DOES NOT INCLUDE WEIGHT OF PRECAST BASE. VERTICAL (P) LOAD IS THE DRESSED POLE WEIGHT FOR ERECTION PURPOSES.

PRECAST BASE IDENTIFICATION					
PRECAST BASE TYPE	WEIGHT LBS	OVERALL LENGTH FEET	HEIGHT ABOVE GRADE FEET	EMBEDMENT IN C.I.P. DEEP FOUNDATION FEET	OUTSIDE DIAMETER INCHES
3B	2,670	20'-0"	8'-0"	10'-0"	13.375"
4B	3,710	22'-0"	8'-0"	12'-0"	15.750"

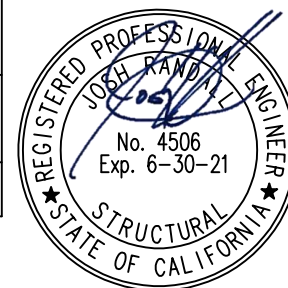
POLE IDENTIFICATION					
LOCATION MARK	POLE TYPE	PRECAST BASETYPE	FIXTURE CONFIGURATION (MAX # OF FIXTURES PER CROSSARM)	FIXTURE EPA (MAXIMUM)	
A1	LSS70-A	3B	4 LED1500	7.8	
C1, C2			3 (2 LED1500, 1 LED900)		
D1, D2			4 LED1500		
A2	LSS70-B	3B	5 (4 LED1500, 1 LED1200)	12.0	
B1	LSS70-C	4B	7 (5 LED1500, 2 LED1200)	16.1	
B2			6 (5 LED1500, 1 LED900)		

LED 900 FIXTURE: EPA = 2.6 SQ-FT MAX & WEIGHT = 40 LBS (FIXTURE ALONE), PER MUSCO LIGHTING, INC.  
 LED 1200 FIXTURE: EPA = 2.4 SQ-FT MAX & WEIGHT = 45 LBS (FIXTURE ALONE), PER MUSCO LIGHTING, INC.  
 LED 1500 FIXTURE: EPA = 2.7 SQ-FT MAX & WEIGHT = 80 LBS (FIXTURE ALONE), PER MUSCO LIGHTING, INC.

**STATEMENT OF SPECIAL INSPECTIONS\***

ITEM	CONTINUOUS/PERIODIC	SCOPE
1. PIER FOUNDATIONS	CONTINUOUS	INSPECT INSTALLATION OF DRILLED PIER FOUNDATIONS. VERIFY DIAMETER, EMBEDMENT DEPTHS AS SCHEDULED, DEPTHS OF FILL, AND BEARING STRATA
2. CONCRETE PLACEMENT	CONTINUOUS	INSPECT PLACEMENT OF CONCRETE FOR PROPER APPLICATION TECHNIQUES. VERIFY THAT CONCRETE CONVEYANCE AND DEPOSITING AVOIDS SEGREGATION OR CONTAMINATION. VERIFY THAT CONCRETE IS PROPERLY CONSOLIDATED.
3. CRETEX PRECAST/PRESTRESSED CONCRETE BASES	(PCI CERTIFIED)	FABRICATOR EXEMPT.** REFERENCE ICC ESR-3765.
4. STRUCTURAL STEEL	(L.A. CITY APPROVED)	FABRICATOR EXEMPT.** REVIEW CERTIFIED MILL TESTS REPORTS AND IDENTIFICATION MARKINGS.

\* The Special Inspector shall be a qualified person who shall demonstrate competence, to the satisfaction of the Building Official, for inspection of the particular type of construction or operation requiring special inspection.  
 \*\*Special inspections shall not be required when the work is done on the premises of a fabricator registered and approved by the City to perform such work without special inspection.



**GENERAL NOTES**

ALL CONSTRUCTION AND WORKMANSHIP SHALL CONFORM TO THE CALIFORNIA BUILDING CODE, 2019 EDITION.

WIND- ASCE 7-16, Vult = 92 MPH (EXPOSURE C); Vasd = 71 MPH (EXPOSURE C), RISK CATEGORY II

SEISMIC - SS=1.860; S1=0.710; SDS=1.133; SD1=1.033; RISK CATEGORY=II; I=1.0; SITE CLASS=D; R=1.5; SEISMIC DESIGN CATEGORY=D; SEISMIC-FORCE-RESISTING-SYSTEM=NON-BUILDING STRUCTURE, NOT SIMILAR TO BUILDINGS; ANALYSIS PROCEDURE=EQUIVALENT LATERAL FORCE PROCEDURE.

REFERENCE POLE LOCATION DRAWING FOR ACTUAL POLE PLACEMENT AND SITE LOCATION.

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR ALL CONSTRUCTION PROCEDURES AND SAFETY CONDITIONS AT THE JOB SITE.

**SOIL DESIGN PARAMETERS**

REFERENCE GEOTECHNICAL ENGINEERING INVESTIGATION PREPARED BY MILLER PACIFIC ENGINEERING GROUP, DATED JANUARY 10, 2020; MILLER PACIFIC ENGINEERING GROUP PROJECT NO. 1477.072altr(REVa).

ALLOWABLE VERTICAL SOIL CAPACITY - 500 PSF (SKIN FRICTION). THE UPPER 3 FT OF NATURAL SOILS AND 1 FT OF LIME TREATED SOILS SHALL BE NEGLECTED UNLESS CONCRETE OR ASPHALT SURFACING EXISTS ADJACENT TO FOUNDATION.

ALLOWABLE LATERAL PASSIVE SOIL BEARING PRESSURE: 300 PSF/FT TO A MAXIMUM OF 3,000 PSF/FT ACTING OVER AN EFFECTIVE WIDTH OF TWO PIER DIAMETERS.

A REPRESENTATIVE OF MILLER PACIFIC ENGINEERING GROUP SHOULD BE AVAILABLE AT THE TIME OF THE FOUNDATION INSTALLATION TO VERIFY THE SOIL DESIGN PARAMETERS AND TO PROVIDE ASSISTANCE IF ANY PROBLEMS ARISE IN FOUNDATION INSTALLATION.

ENCOUNTERING SOIL FORMATIONS THAT WILL REQUIRE SPECIAL DESIGN CONSIDERATIONS OR EXCAVATION PROCEDURES MAY EXIST. POLE FOUNDATIONS MAY NEED TO BE REANALYZED ACCORDING TO THE SOIL CONDITIONS THAT EXIST.

IF ANY DISCREPANCIES OR INCONSISTENCIES ARISE, NOTIFY THE ENGINEER OF SUCH DISCREPANCIES. FOUNDATIONS WILL THEN BE REVISED ACCORDINGLY.

ALL PRECAST BASES AND CONCRETE BACKFILL MUST BEAR ON AND AGAINST FIRM, UNDISTURBED SOIL OR AS APPROVED BY A GEOTECHNICAL ENGINEER.

ALL EXCAVATIONS MUST BE FREE OF LOOSE SOIL AND DEBRIS PRIOR TO FOUNDATION INSTALLATION AND PLACEMENT OF CONCRETE BACKFILL CASING MAY BE REQUIRED IF CAVING OCCURS. IN SUCH A CASE, APPROVAL BY A GEOTECHNICAL ENGINEER IS REQUIRED.

ALL EXCAVATIONS MUST BE FREE OF WATER OR CONCRETE SHALL BE PLACED WITH A TREMIE PIPE IN ACCORDANCE WITH ACI STANDARD 336. CONCRETE PLACED BY THE TREMIE METHOD SHALL HAVE A MINIMUM ULTIMATE STRENGTH OF 1,000 PSI GREATER THAN REQUIRED UNDER "CONCRETE BACKFILL" BELOW.

**CONCRETE BACKFILL**

CONCRETE BACKFILL WITHOUT STEEL REINFORCEMENT SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH AT 28 DAYS OF 4,500 PSI (2,500PSI USED FOR STRUCTURAL DESIGN). SEE STATEMENT OF SPECIAL INSPECTIONS REQUIRED.

CONCRETE BACKFILL SHALL ATTAIN A MINIMUM STRENGTH OF 2,500 PSI PRIOR TO STEEL POLE ERECTION.

USE TYPE V PORTLAND CEMENT OR AS RECOMMENDED BY THE ENGINEER.  
 MAX. W/C RATIO = 0.45

MIX IN CONFORMANCE WITH ASTM C-94

AGGREGATES PER ASTM C-33. (1" MAX AGG. SIZE). 3/8" MAX AGG. SIZE ACCEPTABLE WHERE PUMP MIXES ARE USED FOR UNREINFORCED CONCRETE BACKFILL.

PLACE CONCRETE IMMEDIATELY AFTER COMPLETION OF EXCAVATION AND INSPECTION BY THE GEOTECHNICAL ENGINEER. NO EXCAVATIONS SHALL BE LEFT UNPROTECTED OR OPEN OVERNIGHT.

CONCRETE SHALL BE PLACED IN ONE CONTINUOUS OPERATION (NO CONSTRUCTION JOINT) TO GRADE WITH SPECIAL EQUIPMENT, WITH A MAXIMUM FREEFALL OF 5 FT AND TO PREVENT CONCRETE FROM STRIKING THE SIDES OF THE EXCAVATION. VIBRATE TOP 5 FT.

**MISCELLANEOUS**

FIXTURES MUST BE LOCATED TO MAINTAIN 10'-0" MINIMUM HORIZONTAL CLEARANCE FROM ANY OBSTRUCTION.

POLES, FIXTURES, PRECAST BASES, ELECTRICAL ITEMS, PLATFORMS, SPECIFICATIONS, AND INSTALLATION PER MUSCO LIGHTING, INC.

POLE SUPPORT FOUNDATION	MUSCO LIGHTING, INC. 2107 STEWART ROAD MUSCATINE, IOWA 52761 MUSCO No. 188270	DATE 05/03/21
PETALUMA COMMUNITY SPORTS FIELD BASEBALL DIAMOND PETALUMA, CA	KNA STRUCTURAL ENGINEERS 9931 MUIRLANDS BLVD. IRVINE CA, 92618 KNA No. 363.787	SHEET C1 OF 1

## SECTION 26 56 00 SPORTS FIELD LIGHTING

### PART I - GENERAL

#### **1.01 Related Documents**

Drawings and general provisions of the bid documents, including general and supplementary conditions apply to this section.

#### **1.02 Description of Work**

- A. The Sports Lighting section includes:
  - 1. Galvanized steel pole and luminaire mounting crossarms
  - 2. LED Luminaire, with appropriate glare/spill light control
  - 3. Remote driver enclosure
  - 4. Pole Foundations (No direct burial steel poles allowed)
  - 5. Control System
  
- B. The purpose of this specification is to define the performance standards, product values and features, required manufacturer's service responsibilities, and design standards for Petaluma Community Sports Field Baseball in Petaluma, CA.

#### **1.03 Submittals**

- A. Musco Sports Lighting LLC is the only pre-approved equipment supplier.
- B. Submit each item in this article according to the conditions of the contract and specification section. Any deviations to the specification require the manufacturer to list and describe in detail such deviations. Failure to provide this information shall be grounds for immediate rejection.
- C. Submittal information required:
  - 1. Light scans as per Section 1.04 of the specification.
  - 2. Spill scans as per Section 1.05 of the specification.
  - 3. Detailed warranty information as per Section 3.01 of the specification.
  - 4. Detail foundation design as described in Section 2.01
  - 5. Provide written information for the automated control system to include monitoring. Also provide examples of system reporting and access for numbers for personal contact to operate the system.
  - 6. A list of 5 similar project references in the State of California in the past 5 years using the proposed equipment. The list shall include contact names and phone numbers.
  - 7. The manufacturer must submit evidence in the form of a letter from a California Licensed structural engineer that the manufacturer has the ability to confirm to the California Title 24 structural design requirements.
  - 8. Lighting Manufacturer will supply certified photometric reports from Independent Testing Lab (ITL) or a Certified Lab along with an aiming angle summary for verification.

## 1.04 Sports Lighting Performance

- A. Illumination Levels and Design Factors: The illumination levels specified shall be based on light levels for 25 years. Light levels shall not drop below specified targeted lighting levels during the specified warranty period. Appropriate light loss factors shall be applied and submitted for the basis of design.

Area of Lighting	Light Level	Uniformity	# of Points	Size of Area	Grid Spacing
Baseball Field (infield)	50 footcandles	2.0:1	25	Irregular 324'/363'/330'	30' x 30'
Baseball Field (outfield)	30 footcandles	2.5:1	109	324'/363'/330'	30' x 30'
Bullpens	30 footcandles	2.5:1	16	Bullpen	10' x 10'
Batting Cages	30 footcandles	2.5:1	14	Batting Cage	10' x 10'
Bleachers	7 footcandles	10.5:1	28	Bleachers	10' x 10'

**\*Poles shall not exceed 70' in total height\***

## 1.05 Spill And Glare Analysis

- C. Submitted spill/glare computer models shall depict the field test stations at the park property line. The test stations shall be shown every 30' along the line with the field lights on. Bidder shall submit, as described below:

	Average	Maximum
Maximum Vertical Footcandles	.75 fc	21 fc
Horizontal Footcandles	.50 fc	12 fc
Candela Values	8,800 cd	278,500 cd

## B. MATERIALS

### A. Pole Structural Steel

1. The pole shafts shall be high strength low alloy tapered tubular steel that is equal to current ASTM A595 standards, with galvanized coating inside and out. All connections of pole sections shall be by slip fitting the top section over the lower section by a length of at least 1.5 times the diameters.
2. Steel components of the poles shall be hot dip galvanized to current ASTM A-123. Steel portions of the pole shall be constructed such that all segments of the pole can be readily heated to like temperatures in commercially available galvanizing methods.
3. To avoid problems of galvanize adherence to differing steel alloys, all steel components used for the pole must be of the same type steel.

4. All exposed steel components of the pole shall be at least 18" above the surface of the ground to avoid exposure of the steel to the heavily moisture and oxygen laden air, both above and below the surface. There shall be a cap to cover the top of the pole so that rain will not enter the interior of the pole.
5. To avoid stress corrosion of the pole, there shall be no weld points of the steel portion of the pole within 18" of the ground. The pole shall be galvanized steel.
6. The poles for this project have been designed to withstand 95 mph winds based upon CBC-C standards. The premise of the wind speed criteria will be the 50 year mean recurrent isotach wind map. Applicable gust factors to be applied per code.

#### B. Foundation Design

1. The Manufacturer shall provide a stamped foundation design, prepared by a Structural Engineer, licensed in the State of California.
2. The foundation design shall be based upon recommendations contained in the Geotechnical Report furnished by the Owner. Miller Pacific Engineering Group, January 10, 2020. File:1477.072altr(REVa).
3. It is the contractor's responsibility to notify the owner of soil conditions other than the design criteria. The owner shall then be responsible and absorb the additional costs associated with: Providing engineered foundation embedment design by a registered engineer in the State of California for soils other than specified soil conditions. Additional materials required to achieve alternate foundation. No direct burial steel poles allowed.
4. Lightning Protection: Manufacturer shall provide integrated lightning grounding via concrete encased electrode grounding system as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A. If grounding is not integrated into the structure, the Manufacturer shall supply grounding electrodes, copper down conductors and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780. The grounding electrode shall be not less than 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.

#### C. LED Sports Lighting Fixtures:

The lens is permanently sealed to keep optics away from harmful environmental elements. Fixture is vented and filtered to adapt to environmental elements. Heat sink with a unique convective air cooling design with high thermal conductivity and corrosion resistant construction. Machine mounted surface for maximum heat transfer of diode assembly and maintains low LED junction temperature during high wattage operation. Custom high power diode package with a metal core printed circuit board. The light control visors are factory aimed. Controls and directs more light onto the field which reduced glare and spill and enhances the on-field playability. Fixture is powder coated gray.

#### D. Remote Electrical Enclosure:

Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum enclosures. Drivers are



remote for ease of installation and servicing. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure.

- E. Wire Harness: Spiral wound, abrasion protection sleeve, strain relief, plug-in connections
  
- F. Energy Consumption: The average kWh consumption for the entire facility shall not exceed 46.
  
- G. Controls and Monitoring System:
  - 1. Factory assembled lighting control cabinet (LCC) – The LCC shall be assembled and wired by a UL listed panel builder. The LCC shall contain Contactors, Monitoring and Control System and door mounted Manual off-on-auto selector switches. The LCC shall arrive at the job site ready to attach to an existing wall, switchgear, or a free standing enclosure.
    - a. Control Wire Terminations - The Control Wire Terminations shall include UL listed terminal blocks mounted on a DIN rail and 250 volt, 16 amp, touch safe type fuse holders.
    - b. The ECE shall be constructed of aluminum and shall be powder coated gray. The cabinet door shall utilize a lockable, 3 point latching assembly that provides a NEMA 4 rated seal.
    - c. Contactor Modules – Contactors shall be UL listed for lighting applications. They shall be rated at full capacity, be electrically held, utilize a 120 volt coil and be rated for operation in a ambient temperature range from -40 degrees C to +70 degrees C.
    - d. Manual off-on-auto Selector Switches – For on site manual control, three position selector switches shall be factory mounted to the ECE door. The switches shall be keyed and maintain position, with make before break contacts. The switches shall be factory wired to control terminal blocks.
    - e. Warranty – The LCC shall be covered under the standard warranty for the accompanying lighting equipment.
  - 2. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The manufacturer shall notify the owner of outages within 24 hours, or the next business day. The controller shall determine switch position (manual or auto) and contactor status (open or closed). The Monitoring System shall be factory wired to control terminal blocks.
  - 3. Remote Lighting Control System: The Lighting Control System shall allow owners and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with

reporting needs. The Light Control System shall be factory wired to control terminal blocks.

### **3.01 Warranty**

- A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather conditions events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.
- B. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Owner agrees to check fuses in the event of a luminaire outage.

### **3.02 Field Technician**

- A. Manufacturer shall have available a local factory trained technician to provide project support including but not limited to: Lamp replacement, confirm luminaire, aiming points, troubleshoot, and educate customer maintenance personnel.