CONSTRUCTION CONTRACT DOCUMENTS

County of San Mateo

Realize Flood Park Project – Phase One

COUNTY PROJECT NO. P30W1
PROJECT FILE NO. E5041

Flood Park
215 Bay Road, Menlo Park, CA

APPROVED: November 7, 2023

ANN MADER STILLMAN
(R.C.E. No. 47882)
Director of Public Works

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES
12/31/23
CIVIL
STATE OF CALIFORNIA

County of San Mateo Public Works Department
555 County Center, 5th Floor
Redwood City, CA 94063

FLOOD PARK RENOVATION – PHASE 1

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DIVISION 01 – GENERAL REQUIREMENTS

REALIZE FLOOD PARK PROJECT – PHASE 1

SUPPLEMENTAL DOCUMENTS

- Arborist Report and Tree Survey
- Geotechnical Report
- Synthetic Turf Supplemental Memo
- San Francisco Public Utilities Commission – Right-Of-Way Guidelines
- Flood Park Environmental Impact Report – Mitigation Monitoring and Reporting Program
    - Refer to Full EIR Document for more information
- San Mateo County IPM Policy
- Limited Asbestos & Lead Survey Report
- Anticipated Site Logistics and Access Plan

NOTICE TO BIDDERS

NOTICE IS HEREBY GIVEN that the County of San Mateo will receive sealed bids for the Realize Flood Park project located at Flood Park, Menlo Park, CA in accordance with the plans and specifications prepared by **CMG Landscape Architecture** ("Design Team").

1. Time of Opening: Bids will be opened on **Thursday, January 18, 2024.** Bid documents must be sealed, marked with the project name and project number. All Bids must be received at the office of the County Executive/Clerk of the Board Supervisor, Hall of Justice and Records at 400 County Center, Redwood City, CA 94063 **BEFORE 2:30 p.m.** Bids which are submitted on or after **2:30 p.m.** or facsimile bid transmissions will not be accepted. The bids will be publicly opened and read aloud for the following project in accordance with the specifications therefore and to which special reference in made as follows:

REALIZE FLOOD PARK PROJECT – PHASE ONE

COUNTY PROJECT NO. P30W1
PROJECT FILE NO. E5041

2. Contractors Requirements:

a. All Bidders must have and maintain a General Engineering "A" Class or General Contractor "B" Class contractor's license in order for their bids to be considered responsive. Bidder may bid only on work of a kind for which it is properly licensed by the California Contractors' State License Board. Joint venture Bidders must possess a joint venture license. The Bidder must be licensed at the time of bid and the license must remain current for the duration of the Project. Failure to supply complete license requirement information and signature under penalty of perjury on the bid form may result in the bid being considered non-responsive and rejected.

b. Pursuant to Senate Bill (SB) 854, all bidders on public works, including any project resulting from this bid process, must register with the California Department of Industrial Relations (DIR) and pay an annual renewal fee to the DIR. Only bidders that have registered with the DIR and that are current in payment of annual renewal fees are eligible to bid as contractors or subcontractors on any project resulting from this bid process. Likewise, only contractors and subcontractors that have registered with the DIR and who are current in payment of their annual renewal fees shall be eligible to receive a contract or subcontract or to perform work under any contracts resulting from this bid process. Pursuant to the California Labor Code, the general prevailing rate of per diem wages and for holiday and overtime work shall be paid to all workers employed by the contractor selected for this project. Copies of prevailing rates of per diem wages are available upon request at the County's Offices or at www.dir.ca.gov. The Department of Industrial Relations/Labor Commissioner will monitor and enforce compliance with applicable prevailing wage requirements on this project and enforce compliance with applicable prevailing wage requirements in accordance with the California Labor Code, including sections 1771, 1774, 1776, 1777.5, 1813, and 1815. Contractors on any project resulting from this bid process will be required to submit certified payroll records in electronic format to the California Labor Commissioner unless excused by the Labor Commissioner from this requirement.

3. Duration of Bid: All bid proposals submitted shall be considered irrevocable offers to perform the work in accordance with the Contract Documents if a Notice of Award is issued within thirty (30) days from the bid opening.

4. Plans and Specifications: Plans and specifications for the above-mentioned project will be available on **November 6, 2023 on the San Mateo County Department of Public Works website (https://www.smcgov.org/publicworks/Realize-Flood-Park-Project-Phase-One-POTB)**.

County recommends the Contractors to be placed on a Plan Holders List for bidding. To be placed on the Plan Holders List, the Contractor shall either:

a. Complete and sign the following Plan Holder's Affidavit by using the link below and you will receive a separate link for downloading an electronic copy of the Plans and Specifications:
https://www.smcgov.org/publicworks/affidavit-form-realize-flood-park-project

The Contractor is advised that the table should be received by the County no later than three (3) working days prior to the bid opening date.

b. If Plans and specifications are obtained through a source other than those outlined in 1a above, complete and sign the following Plan Holder's Affidavit and return to the County by either PDF via email to alum@smcgov.org. The Contractor is advised that the table should be received by the County no later than three (3) working days prior to the bid opening date.

Plan Holder's Affidavit			
Project Title	REALIZE FLOOD PARK – PHASE ONE		
Project No.	P30W1	Project Engineer:	Anthony Lum
		Project Manager:	Anthony Lum
Bid Open Date and Time:	2:30 p.m., Thursday, January 18, 2024		
Company Name:			
Mailing Address:			
Phone Number:		Fax Number:	
E-mail Address:			
(Name and Title of Authorized Representative of Bidder)			
(Signature of Authorized Representative of Bidder)			

c. The Plan Holders List will be posted to the County of San Mateo's Public Works website two (2) working days prior to the bid open date.

d. Questions regarding the Contract Documents concerning items such as discrepancies, conflicts, omissions, doubts as to meanings, or regarding scope of bid items shall be referred to the Engineer. Inquiries must be received in writing via email, to alum@smcgov.org and cc: matthewe@capitalpm.com not less than five (5) working days prior to bid opening. Inquiries will be answered in writing via email response if written clarification is warranted, in the opinion of the Engineer, then inquiries and responses will be posted to the Project's page on the County of San Mateo's Public Works website. It will be the Contractor's sole responsibility to ensure that they receive responses, *if any.* The County will not be responsible for oral clarifications.

e. It will be the Contractor's sole responsibility to ensure that they have received addendums, *if any,* which will be posted to the County of San Mateo's Public Works website on the same day issued. Said addendums will also be sent to all current plan holders and made available during purchase of Plans and Specifications.

f. Plans and Specifications, including forms of proposal and contract, may be purchased at the contractor's expense from the County of San Mateo Department of Public Works. When purchasing by phone (650-363-4100), please send check payable to "County of San Mateo" to 555 County Center, 5th Floor, Redwood City, CA 94063.

5. Inspection of Site: Non-Mandatory Pre-Bid Site Inspection and Conference will be held at **Flood Park, 215 Bay Rd., Menlo Park, CA on November 16, 2023 at 10:00 AM.** All attendees are to meet in the **Oak Picnic Area** at Flood Park. Attendees must sign in by scheduled time. The County shall have the discretion to bar attendees who fail to arrive by scheduled time from signing in if the circumstances warrant. Before submitting a bid proposal, Bidders shall examine the drawings, read the specifications, the form of Agreement, and other Contract Documents. They shall visit the site of the proposed Project; examine the building, or buildings, if any, and any work that may have been done thereon. They shall fully inform themselves of all conditions on, in, at, and about the site, the buildings, if any, and any work that may have been done thereon.

6. Format of Bids: Bid proposals shall be made on the Bid Form included with the Contract Documents. All items on the form must be filled out. Numbers on the Bid Form document shall be written as Arabic numbers and shall also be written out as words and the signatures of all individuals must be in longhand. The completed form should be without interlineations, alterations, or erasures. A bid response to any specific item of this bid with terms such as "negotiable" "will negotiate" or similar, will be considered as nonresponsive to that specific term.

7. Method of Determining Lowest Bidder: The lowest bidder will be determined based on the lowest Total Base Bid as described on the Bid Form.

8. Signatures on Bids: Each bid must give the full business address of the Bidder. Bids by partnerships must furnish the full name of all partners and must be signed in the partnership's name by one of the members of the partnership, or by an authorized representative, followed by the signature and designation of the person signing. Bids by corporations must be signed with the legal name of the corporation, followed by the name of the state of the incorporation and by the signature and designation of the president, secretary, or other person authorized to bind it in the matter. The name of each person signing shall also be typed or printed below the signature. When requested by the County satisfactory evidence of the authority of the officer signing on behalf of the corporation shall be furnished.

9. Taxes: Taxes shall be included in the bid prices.

10. Use of Subcontractors: Pursuant to the provisions of sections 4100 to 4114, inclusive, of the California Public Contract Code, every Bidder shall, in its bid, set forth:

a. The name and location of the place of business of each subcontractor who will perform work or labor or render service to the Bidder in or about the construction of the Project or improvement, or a subcontractor licensed by the State of California who, under subcontract to the Bidder, specially fabricates and installs a portion of the Project or improvement according to detailed drawings contained in plans and specifications, in an amount in excess of one-half (1/2) of one percent (1%) of the Bidder's total bid.

b. The portion of the Project which will be done by each such subcontractor. If the Bidder fails to specify a subcontractor for any portion of the Project to be performed under the Agreement in excess of one-half (1/2) of one percent (1%) of the Bidder's total bid, it agrees to perform that portion itself. The successful Bidder shall not, without the consent of the County, either:

i. Substitute any person as subcontractor in place of the subcontractor designated in the original bid.

ii. Permit any subcontractor to be assigned or transferred or allow the work to be performed by anyone other than the subcontractor.

iii. Sublet or subcontract any portion of the Project in excess of one-half (1/2) of one percent (1%) of the total bid as to which its original bid did not designate a subcontractor. In accordance with Public Contract Code section 7106, each Bidder shall be required to complete the Non-Collusion Declaration form, which is included in and is part of the Contract Documents.

Further, pursuant to SB 854, only subcontractors who have registered with the DIR and who are current in paying the annual renewal fee to the DIR shall be eligible to perform work on the project resulting from this bid process.

11. Sureties: Any bonds must be issued by an admitted surety insurer, as defined in California Code of Civil Procedure sections 995.010, *et seq*.

12. Bid Proposal Security: Bid proposals should be accompanied by a certified cashier's check or Bidder's bond for an amount not less than ten percent (10%) of the maximum contract price. The cashier's check or bid bond shall be made payable to the order of the County. The cashier's check or bond shall be given as a guarantee that the Bidder will enter into the Agreement if awarded the Project, and in the case of refusal or failure to enter into the Agreement within ten (10) calendar days after notification of the award of the Agreement, the cashier's check or bond, as the case may be, shall be retained by the County as liquidated damages. Failure to provide bid security, or bid security in the proper amount, may result in rejection of the bid. Cashiers or certified checks that are filed with the bid will be returned to the unsuccessful Bidder(s) within ten (10) calendar days after the award of the Agreement resulting from this bid process.

13. Evidence of Responsibility: Prior to awarding a contract, the County may require the Bidder to submit evidence of the Bidder's and/or the Bidder's subcontractor's qualifications to perform the proposed agreement. The County may consider such evidence before making its decision awarding the proposed agreement. Failure to submit evidence of the Bidder's or its subcontractors' responsibility to perform the proposed agreement may result in rejection of the bid.

14. Bid Protest: Bid protests shall be filed in writing with the County of San Mateo, Director of Public Works, at 555 County Center, 5th floor, Redwood City, CA 94063 by registered mail, not later than three (3) working days after the bid opening. The protest shall include project name, project file number, and a complete statement describing the reasons and facts upon which the protest is based. Ultimately protests, which do not meet the deadline requirements specified above, will not be accepted or considered. If a valid protest is filed timely, the Department will investigate the bid protest. The protested bidder shall

have three (3) business days to respond to the Department and to provide any information requested by the Department. The Department shall respond to the protesting party, stating its findings. The Department Director shall make a recommendation to the San Mateo County Board of Supervisors regarding the bid protest.

15. Award of Agreement/Rejection of Bids: The County may issue a "Notification of Apparent Low Bid" to the bidder that it determines to be the lowest responsible and responsive bidder. The County reserves the right to reject any or all proposals, to contract work with whomever and in whatever manner, to abandon the Project entirely, or to waive any informality in bids received. Unless and until a “Notice to Proceed” is issued by the County, no obligation on behalf of either party exists. Upon issuance of the “Notice to Proceed”, the successful bidder will post all required bonds and submit proper evidence of insurance coverage as called for by the Contract Documents. If this is not accomplished within ten (10) calendar days, the County reserves the right to cash bidder's bid security check to cover the differential in the higher bid award and the County administrative costs, and award the bid to the next lowest responsible and responsive bidder or otherwise proceed as allowed by law.

16. Form of Agreement: The form of contract which the successful Bidder will be required to execute, if awarded the Project, shall be per the attached template that is contained in the bid package. The terms and conditions, in their entirety, in the County’s Agreement are NOT NEGOTIABLE. Proposals requesting modifications to the non-negotiable terms will be deemed non-responsive and will not be reviewed. The Agreement shall contain, among other things, matters required by State law to be inserted in contracts for public work.

17. Payment and Performance Bonds: The successful Bidder, upon notice of award of bid and prior to commencing Project, shall furnish in duplicate a labor and material bond in the amount of one hundred-fifteen percent (115%) of the contract sum and a faithful performance bond in the amount of one hundred-fifteen percent (115%) of the contract sum.

18. Insurance: Prior to commencing work, the Contractor is required to furnish the County with Certificates of Insurance for workers' compensation, and comprehensive General Liability including broad form property damage, automobile liability and all additional requirements per Article 16 of the Agreement. As set forth more fully in Article 16 of the Agreement, the County has reserved the right to modify the insurance requirements contained in the Agreement, including but not limited to, by implementing, an Owner Controlled Insurance Program (“OCIP”) for the Project.

19. Prevailing Wage Rates: In accordance with the provisions of section 1770 of the Labor Code, the Director of the Department of Industrial Relations of the State of California has determined the general prevailing rates of wages and employee payments for health and welfare, pension, vacation, travel time, working hours and apprenticeable training requirements which must be paid to all workers on public work contracts. (See Labor Code § 1770, *et seq.*)

20. Non-Discrimination: The County will affirmatively ensure that in any contract entered into pursuant to this advertisement, qualified contractors will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, creed, sex or national origin in consideration for award.

21. Withdrawal or Modification of Bid Proposals: Bid proposals may be withdrawn or modified by the Bidder prior to the time fixed for the opening of bids. A notice of withdrawal or modification to a bid must be signed by the Bidder or its designated representative. Following bid opening, a Bidder shall not be relieved of its bid unless by consent of the County or Bidder's recourse to Public Contract Code sections 5100-5108. Bidders must hold their bids open for one hundred and twenty (120) days after the Bid Opening Date.

22. Prevailing Law: In the event of any conflict or ambiguity between these instructions and state or federal law or regulations, the latter shall prevail.

23. Forms to Submit with Bid: Except for Deferred Items, all bid proposals shall include the following documents, each complete in its entirety. Deferred Items shall be submitted within 24 hours after submission of Bid. Failure by the bidder to submit the documents/forms will render the bid non-responsive.

Bid Form
Bid Bond
Non-Collusion Declaration
Designation of Subcontractors
Statement of Compliance
Iran Contracting Act Certification
Certification of Bidder's Qualifications and Experience

Publication Dates: **November 9, 2023**

BID FORM

County of San Mateo Department of Public Works

Realize Flood Park Project – Phase One

_____
(Date)

County of San Mateo Department of Public Works
555 County Center, 5th Floor
Redwood City, CA 94063

The Undersigned, doing business under the firm name of _____, hereby proposes and agrees to enter into an agreement, to furnish any and all labor, materials equipment and services for the completion of work described hereinafter and in the Contract Documents entitled construction of:

Realize Flood Park Project – Phase One

Prepared by:

_____
(Estimator Name)

A. **BASE BID:** Based upon all work required to satisfactorily complete the work indicated in the related Plans and Specifications complying with the Division of State Architect and in Section 00700 Scope of Work.

TOTAL BASE BID: Realize Flood Park Project as indicated on the plans.

LUMP SUM IN WORDS & FIGURES

_____DOLLARS

$_____

The low bidder will be determined based on above "Total Base Bid".

B. **LETTER OF INTENT TO AWARD:** The undersigned hereby designates as its office to which the Notice of Apparent Low Bid may be mailed, e-mailed, or delivered:

_____

C. **INSURANCE:**

(1) Our Public Liability and Property Damage Insurance is placed with

_____

_____

(2) Our Workers' Compensation Insurance is placed with

_____

_____

E. COMPLETION DATE.

Contractor agrees that all work required to be performed by the Contract Documents shall be completed by all milestone dates specified in Section 00800 Special Provisions. Contractor acknowledges that it shall be liable for liquidated damages if the Project is not completed by these dates.

E. ADDENDA.

Contractor acknowledges receipt of the following addenda:

Addendum No. ____ Date of Document: _____
Addendum No. ____ Date of Document: _____
Addendum No. ____ Date of Document: _____
Addendum No. ____ Date of Document: _____

F. EXECUTION OF BID.

If the Bidder is a corporation, state the capacity/title of the corporate officer signing and affix the corporate seal; if a partnership, all partners should sign under the partnership name on a separate page attached to and made part of the bid. Unsigned bids will not be accepted. The undersigned declares under penalty of perjury under the laws of the State of California that the representations made in this bid are true and correct.

_____	_____
SIGNATURE	**TITLE**
_____	_____
NAME OF COMPANY AS LICENSED	**CONTRACTOR LICENSE NO.**
_____	_____
ADDRESS	**CLASS EXPIRATION DATE**
_____	_____
CITY	**STATE ZIP**
_____	_____
TELEPHONE NUMBER	**DATE**
	_____
	DIR REGISTRATION NO.

BID BOND

KNOW ALL MEN BY THESE PRESENTS that we the undersigned _____ as Principal and _____ as Surety, are hereby held and firmly bound unto the [County of San Mateo Department of Public Works] "County" in the sum of _____ Dollars ($_____) for payment of which sum, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that whereas the Principal has submitted to the County a certain bid, attached hereto and hereby made a part hereof, to enter into a contract in writing for the construction of

County of San Mateo Department of Public Works

Realize Flood Park Project – Phase One

in strict accordance with Contract Documents.

NOW, THEREFORE,

a. If said bid shall be rejected, or, in the alternative;

b. If said bid shall be accepted and the Principal shall execute and deliver a contract in the form of agreement attached hereto and shall execute and deliver Performance and Payment Bonds in the forms attached hereto (all properly completed in accordance with said bid), and shall in all other respects perform the agreement created by the acceptance of said bid;

Then this obligation shall be void, otherwise the same shall remain in full force and effect, it being expressly understood and agreed that the liability of the Surety for any and all default of the Principal hereunder shall be the amount of this obligation as herein stated.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract on the call for bids, or to the work to be performed hereunder, or the specifications accompanying the same, shall in any way affect its obligation under this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of said contract or the call for bids, or to the work, or to the specifications.

In the event suit is brought upon this bond by the County and judgment is recovered, the Surety shall pay all costs incurred by the County in such suit, including a reasonable attorney's fee to be fixed by the court.

IN WITNESS WHEREOF, the above-bound parties have executed this instrument under several seals this _____ day of _____, 20__, the name and corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body. In presence of:

(Notary Seal)

_____
(Principal)

_____
(Business Address)
_____

_____

_____
(Corporate Surety)

By:_____

_____
(Business Address)
_____

The rate or premium of this bond is _____ per thousand, the total amount of premium charged, $_____.

(The above must be filled in by Corporate Surety).

NONCOLLUSION DECLARATION

County of San Mateo Department of Public Works

Realize Flood Park Project – Phase One

I, _____, declare that I am 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 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 Agreement of anyone interested in the proposed Agreement; that all statements contained in the bid are true, and, further, that the Bidder has not, directly or indirectly, submitted its 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 of 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.

_____
(Date)

_____
(Print Name)

_____
(Signature)

_____
(Official Capacity)

_____
(Company Name)

_____
(Company Address)

_____

_____
(Company Telephone Number)

DESIGNATION OF SUBCONTRACTORS

Bidders shall state the portion of work by trade (electrical, painting, etc.) that each subcontractor will perform. Additionally, the Bidder shall state the name and business address for all designated subcontractors. Failure to provide this information in a legible manner may result in the rejection of an otherwise acceptable bid.

In compliance with the provisions of sections 4100 to 4113, inclusive, of the California Public Contract Code, and any amendments thereof, each Bidder shall set forth below the name and the location of the mill, shop, or office of each subcontractor who will perform work or labor or render service to the Bidder on, in, or about the construction of the work or improvement to be performed under these specifications and the portion of the work which will be done by each subcontractor. In addition, effective July 1, 2014, pursuant to Assembly Bill 44 (AB 44), Contractors are required to list the license numbers of all subcontractors required to be listed below. AB 44 provides a grace period of twenty-four hours after bid opening for Bidders to provide subcontractor license numbers that were omitted or incorrect as of the time of bid opening. Further, pursuant to Senate Bill 854 (SB 854), only subcontractors who have registered with the California Department of Industrial Relations (DIR) and who are current in paying the annual renewal fee to the DIR shall be eligible to perform work on the project resulting from this bid process.

If the Bidder fails to specify a subcontractor for any portion of the work to be performed under the contract, the Bidder shall be deemed to have agreed to perform such portion itself, and it shall not be permitted to subcontract that portion of the work except under the conditions hereinafter set forth.

Subletting or subcontracting of any portion of the work as to which no subcontractor was designated in the original bid shall only be permitted in cases of public emergency or necessity, and then only after a finding reduced to writing as a public record of the legislative body of the County.

[USE FORM ON THE FOLLOWING PAGE]

DESIGNATION OF SUBCONTRACTORS

PRINT LEGIBLY, USE ADDITIONAL PAGE AS NECESSARY

PORTION OF WORK	SUBCONTRACTOR	LOCATION (CITY & STATE)	SUBCONTRACTOR LICENSE #	SUBCONTRACTOR DIR #

STATEMENT OF COMPLIANCE

County of San Mateo Department of Public Works

Realize Flood Park Project – Phase One

_____
(Company Name)

(hereinafter referred to as "prospective Contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 and provisions of the California Code of Regulations promulgated pursuant to Section 12990 in matters relating to the development, implementation, and maintenance of a nondiscrimination program. Prospective Contractor agrees not to unlawfully discriminate against any employee or applicants for employment because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation, or military and veteran status.

I, _____
(Name of Official)

hereby swear that I am duly authorized to legally bind the prospective Contractor to the above-described certification. I am fully aware that this certification, signed on _____
(date)

in the County of _____, is made under the penalty of perjury
(County)

under the laws of the State of California.

_____
(Signature)

_____

(Print or Type Title)

IRAN CONTRACTING ACT CERTIFICATION
(Public Contract Code Section 2200, *et seq*.)

County of San Mateo: Realize Flood Park Project – Phase One

Contractor Name: _____

I, the person who is identified below and who has signed this certification, hereby certify, subject to penalty for perjury, that: (i) I have inherent authority, or I have been duly authorized by the Contractor, to execute this certification on behalf of the Contractor; and (ii) the option checked below relating to the Contractor's status in regard to the Iran Contracting Act of 2010 (Public Contract Code Section 2200, *et seq*.) is true and correct:

□ The Contractor is not:

(i) identified on the current list of persons and entities engaging in investment activities in Iran prepared by the California Department of General Services in accordance with subdivision (b) of Public Contract Code Section 2203; or

(ii) a financial institution that extends, for 45 days or more, credit in the amount of $20,000,000 or more to any other person or entity identified on the current list of persons and entities engaging in investment activities in Iran prepared by the California Department of General Services in accordance with subdivision (b) of Public Contract Code Section 2203, if that person or entity uses or will use the credit to provide goods or services in the energy sector in Iran.

□ The County has exempted the Contractor from the requirements of the Iran Contacting Act of 2010 after making a public finding that, absent the exemption, the County will be unable to obtain the goods and/or services to be provided pursuant to the Contract.

□ The Final Contract Sum, as defined in Section 5 of the Agreement, payable to the Contractor for the Project as of the date of this certification does not exceed $1,000,000.

Certifier Signature: _____

Printed Name: _____

Title: _____

Date Executed: _____

Please note: In accordance with Public Contract Code Section 2205, false certification of this form may result in civil penalties equal to the greater of $250,000 or twice the contract amount, termination of the contract and/or ineligibility to bid on contracts for three years.

CERTIFICATION OF BIDDER'S

QUALIFICATIONS AND EXPERIENCE

(To Be Submitted With Proposal)

The undersigned Bidder certifies that it is, at the time of bidding, and shall be, throughout the period of the contract, licensed under the provisions of Chapter 9, Division 3, of the Business and Professions Code of the State of California, to do the type of work contemplated in the Contract Documents. Bidder further certifies that it is skilled and regularly engaged in the general class and type of work called for in the Contract Documents.

The Bidder represents that it is competent, knowledgeable, and has special skills concerning the nature, extent, and inherent conditions concerning the work to be performed. Bidder further acknowledges that there are certain inherent conditions existent in the construction of the project which may create, during the construction program, unsafe conditions hazardous to persons and property. Bidder expressly acknowledges that it is aware of such risks and that it has the skill and experience to foresee and to adopt protective measures to adequately and safely perform the construction work with respect to such hazards.

A. ESSENTIAL REQUIREMENTS FOR QUALIFICATION

If the answer to any of questions 1 through 4 is "yes", or if the answer to question 5 is "no", the Bidder will be deemed ineligible or not responsible for purposes of the Contract.

1. Has your contractor's license been revoked at any time in the last five (5) years?
   ☐ Yes ☐ No

2. Has a surety firm completed a contract on your behalf, or paid for completion because your firm was default terminated by the project owner within the last five (5) years?
   ☐ Yes ☐ No

3. At the time of submitting this qualification form, is your firm ineligible to bid on or be awarded a public works contract, or perform as a subcontractor on a public works contract, pursuant to either Labor Code section 1777.1 or Labor Code section 1777.7?
   ☐ Yes ☐ No

4. At any time during the last five (5) years, has your firm, or any of its owners or officers been indicted for, plead guilty to or convicted of any crime related to the awarding of a contract of a government construction project, or the bidding or performance of a government contract?
   ☐ Yes ☐ No

5. The Bidder has been engaged in the contracting business, under the present business name for at least 5 years and has experience in work of a nature similar to this project?
   ☐ Yes ☐ No

B. COMPANY EXPERIENCE

The Bidder, as a Contractor, has never failed to satisfactorily complete a contract awarded to it, except as follows:

_____

_____

For the County of San Mateo to consider the Bidder properly experienced in work of similar nature to this project, the Bidder must list at least two public park projects that involved tree protection, utility installation,

noise mitigations, parking lot improvements (each can be in separate projects, i.e. list 2 projects for parking lot improvements and another 2 projects for park improvements) within the last ten (10) years.

Any projects listed below which are not as defined above will not be considered by the County of San Mateo in meeting this experience requirement.

Bidder also certifies that Bidder self-performed at least fifty percent (50%) of the Work when acting as a general contractor or ten percent (10%) of the Work when acting as a subcontractor on each of the projects listed below. The County of San Mateo considers this level of past self-performance demonstrates a benefit to a Project in terms of better control of cost, schedule and safety.

If the Bidder is a Joint Venture of two or more companies, each participant in the Joint Venture shall meet this prior project experience requirement and provide project information for each Joint Venture participant in the format below.

1. **Project Name & Description:** _____

_____

_____

Owner: _____

General Contractor or Subcontractor for Project: _____

Work Performed: _____

Total Construction Cost: $ _____

Dollar Amount of Bidder's Work: $ _____

Construction Time: _____ **Calendar Days**

Owner's Representative: _____

Owner's Telephone No.: _____

Date of Substantial Completion: _____

2. **Project Name & Description:** _____

_____

_____

Owner: _____

General Contractor or Subcontractor for Project: _____

Work Performed: _____

Total Construction Cost: $ _____

Dollar Amount of Bidder's Work: $_____

Construction Time:_____ **Calendar Days**

Owner's Representative:_____

Owner's Telephone No.:_____

Date of Substantial Completion:_____

3. **Project Name & Description:**_____

_____

_____

Owner:_____

General Contractor or Subcontractor for Project:_____

Work Performed:_____

Total Construction Cost: $_____

Dollar Amount of Bidder's Work: $_____

Construction Time:_____ **Calendar Days**

Owner's Representative:_____

Owner's Telephone No.:_____

Date of Substantial Completion:_____

4. **Project Name & Description:**_____

_____

_____

Owner:_____

General Contractor or Subcontractor for Project:_____

Work Performed:_____

Total Construction Cost: $_____

Dollar Amount of Bidder's Work: $_____

Construction Time:_____ **Calendar Days**

Owner's Representative: _____

Owner's Telephone No.: _____

Date of Substantial Completion: _____

The undersigned hereby states that all representations regarding the Bidder's Company Experience are correct and true.

Signed this _____ day of _____, 20____

_____
Bidder's Company Name

_____ _____
Authorized Signature Date

_____
Name and Title of Signatory

DEBARMENT AND SUSPENSION CERTIFICATION

TITLE 49, CODE OF FEDERAL REGULATIONS, PART 29

The bidder, under penalty of perjury, certifies that, except as noted below, he/she or any other person associated therewith in the capacity of owner, partner, director, officer, manager:

- is not currently under suspension, debarment, voluntary exclusion, or determination of ineligibility by any Federal agency;
- has not been suspended, debarred, voluntarily excluded or determined ineligible by any Federal agency within the past 5 years;
- does not have a proposed debarment pending; and
- has not been indicted, convicted, or had a civil judgement rendered against it by a court of competent jurisdiction in any matter involving fraud or official misconduct within the past 5 years.

If there are any exceptions to this certification, insert the exceptions in the following space.

Exceptions will not necessarily result in denial of award, but will be considered in determining bidder responsibility. For any exception noted above, indicate below to whom it applies, initiating agency, and dates of action.

Notes:

(1) Providing false information may result in criminal prosecution or administrative sanctions.

(2) The above certification is part of the Proposal. Signing this Proposal on the signature portion thereof shall also constitute signature of this Certification.

AGREEMENT

This Agreement made and entered into this _____ day of _____, 20__, between the **County of San Mateo, State of California** ("County"), and _____ ("Contractor").

Contractor and County agree as follows:

ARTICLE 1 - THE PROJECT. Contractor agrees to obtain all necessary permits and licenses as are required by law, furnish all labor and materials, including required tools, implements, and appliances and to perform all the work in a good and workmanlike manner, free from any and all liens and claims of mechanics, material, men, subcontractors, artisans, machinists, teamsters, and laborers required in the bid proposal, all in strict compliance with the plans, drawings, and other Contract Documents, required for the Project, which, for purposes of this Agreement, refers to the following:

County of San Mateo Department of Public Works

Realize Flood Park Project – Phase One

COUNTY PROJECT NO. P30W1
PROJECT FILE NO. E5041

Unless otherwise specifically noted, the Contractor shall provide and pay for all labor, materials, equipment, transportation, and other facilities and services necessary for the proper execution and completion of the Project. The Contractor shall at all times enforce strict discipline and good order among Contractor's employees and shall not employ on the Project any unfit person or anyone not skilled in the task assigned.

ARTICLE 2 - THE AGREEMENT: The Contractor and the County agree that the Contract Documents are composed of all those documents described in paragraph 2.1 of the General Conditions, all of which are incorporated herein by reference. The specifications and drawings are to be read together such that any work exhibited in the drawings and not mentioned in the specifications, or vice versa, is to be executed as if both mentioned in the specifications and set forth in the drawings to the true intent and meaning of the said drawings and specifications, when taken together. But no part of said specifications that is in conflict with any portion of this Agreement shall be considered as part of this Agreement.

ARTICLE 3 - CONTRACTOR'S LICENSE: Contractor shall have, and maintain in good standing, and require the same of all its subcontractors, the appropriate classification of California State contractor's license during the entire term of this Project. Contractor confirms that, pursuant to SB 854, it has registered with the California Department of Industrial Relations (DIR) and that it has, through the date of this Agreement, paid all annual renewal fees due to the DIR. Contractor shall pay all annual renewal fees to the DIR that come due during the term of the Agreement.

ARTICLE 4 - COMPLETION DATE / NOTICE TO PROCEED: Contractor agrees that all work required to be performed by the Contract Documents shall be completed by the milestone dates specified in the Section 00800 Special Provisions. Contractor acknowledges that it shall be liable for liquidated damages as set forth in this Agreement if the Project is not completed by these dates.

If the Notice to Proceed and/or the Agreement is issued more than ten (10) but less than ninety (90) days after the "Letter of Intent to Award Contract", Contractor's sole remedy shall be an extension to the Completion Date, measured by the number of days beyond ten (10) it took to issue the Notice to Proceed. In such instances, Contractor shall not be entitled to any monetary damages or other compensation for lost profit or overhead or for increased cost of performance.

The term "day" as used in the Contract Documents shall mean working days, unless otherwise specified.

ARTICLE 5 - CONTRACT SUM: The contract sum is the total amount payable by the County to Contractor for the performance of work under the Contract Documents. The contract sum is _____ Dollars ($_____) ("Contract Sum"), unless modified in writing in accordance with the Contract Documents.

ARTICLE 6 - LIQUIDATED DAMAGES: The Completion Date specified in Article 4 is of the essence of the Agreement. The Contractor shall complete the Project by the date specified in Article 4 unless the County agrees in writing to an extension of time.

Failure to complete the Project within the time and in the manner provided for by the Contract Documents shall subject the Contractor to liquidated damages. The actual occurrence of damages and the actual amount of the damages which the County would suffer if the Project were not completed within the specified times set forth are dependent upon many circumstances and conditions which could prevail in various combinations and, from the nature of the case, it is impracticable and extremely difficult to fix the actual damages. Damages which the County would suffer in the event of delay include, but are not limited to, loss of the use of the Project, disruption of school activities, costs of administration, inspection, supervision and the loss suffered by the public within the County.

Accordingly, the parties agree that the amount herein set forth shall be presumed to be the amount of damages which the County shall directly incur upon failure of the Contractor to complete the Project within the time specified: **One Thousand Dollars** ($**1000.00**), plus the extra inspection costs incurred by the County, during or as a result of each calendar day by which the substantial completion of the Project is delayed beyond the date specified in Article 4 of the Agreement and **One Thousand Dollars** ($**1000.00**), plus the extra inspection costs incurred by the County, during or as a result of each calendar day by which final completion of the Project is delayed beyond the date specified in the Article 4 of the Agreement.

If the Contractor becomes liable for liquidated damages under this section, the County, in addition to all other remedies provided by law, shall have the right to withhold any and all retained percentages of payments, and to collect the interest thereon, which would otherwise be or become due the Contractor until the liability of the Contractor under this section has been finally determined. If the retained percentage is not sufficient to discharge all liabilities of the Contractor incurred under this Article, the Contractor and its sureties shall continue to remain liable to the County until all such liabilities are satisfied in full.

If the County accepts any work or makes any payment under this Agreement after a default by reason of delays, the payment or payments shall in no respect constitute a waiver or modification of any Agreement provisions regarding time of completion and liquidated damages.

ARTICLE 7 - EARLY COMPLETION: Regardless of the cause therefore, the Contractor may not maintain any claim or cause of action against the County for damages incurred as a result of its failure or inability to complete its work on the Project in a shorter period than established in Article 4 of this Agreement, the parties stipulating that such period is a reasonable time within which to perform the work on the Project.

ARTICLE 8 – PAYMENT: The County agrees to pay the Contractor in current funds for the performance of the Agreement the amount proposed in this bid, including approved change orders, and to make payments on account thereof as follows: Each calendar month, ninety-five percent (95%) of the value, proportionate to the amount of the Agreement, of labor and materials incorporated in the Project up to the first day of that month as estimated by the County, and Project Manager, less the aggregate of previous payments. On substantial completion of the entire Project, a sum sufficient to increase the total payments to ninety-five percent (95%) of the contract sum set forth in Article 5 of this Agreement, and thirty-five (35) days after the Notice of Completion has been recorded, provided the Project is fully completed and the Agreement fully performed, the balance due under the Agreement. The payment of progress payments by the County shall not be construed as an acceptance of the work done up to the time of such payments, except as to such matters as are open and obvious. The entire Project is to be subjected to inspection and

approval of the County or Project Manager to defects not obvious upon inspection during the progress of the work at the time when it shall be claimed by the Contractor that the Agreement is completed. The County and Project Manager shall exercise all reasonable diligence in the discovery, and report to the Contractor as the Project progresses, materials and labor which are not satisfactory to the County, so as to avoid unnecessary trouble and cost to the Contractor in making good defective parts or work.

In accordance with the provisions of Public Contract Code section 22300, the County shall, at the request and expense of the Contractor, permit the substitution of securities or the payment of funds equivalent to the amount of monies withheld as retention from progress payments.

ARTICLE 9 - EARLY TERMINATION: Notwithstanding any provision herein to the contrary, if for any fiscal year of this Agreement the governing body of the County fails to appropriate or allocate funds for future periodic payments under the Agreement after exercising reasonable efforts to do so, the County may, upon thirty (30) days written notice, order work on the project to cease. The County will remain obligated to pay for the work already performed but shall not be obligated to pay the balance remaining unpaid beyond the fiscal period for which funds have been appropriated or allocated and for which the work has not been done.

ARTICLE 10 - TERMINATION FOR CAUSE: If Contractor (1) should be adjudged bankrupt; (2) should make a general assignment for the benefit of its creditors; (3) should persistently or repeatedly refuse or fail, except in cases for which an extension of time is provided, to supply enough properly skilled workers or proper materials; (4) should fail to make prompt payment to subcontractors or for material or labor; (5) persistently disregards laws, ordinances or the instructions of the County; or if any of its subcontractors should persistently violate any of the provisions of the Agreement; or (6) a receiver should be appointed on account of Contractor's insolvency, then the County may serve written notice upon the Contractor and its surety of its intention to terminate the Agreement. Unless, within five (5) days after the serving of such notice, such violations shall cease and satisfactory arrangements for corrections thereof be made, the Agreement shall, upon the expiration of said five (5) days, at the County's option, terminate.

In the event of any such termination, the County shall immediately serve written notice thereof upon the surety and the Contractor, and the surety shall have the right to take over and perform the Agreement; provided, however, that if the surety, within ten (10) days after the serving upon it of Notice of Termination, does not give the County written notice of its intention to take over and perform the Agreement or does not commence performance within ten (10) days from the date of the serving of such notice, the County may take over the Project and prosecute the same to completion by Agreement or by any other method it may deem advisable, for the account and at the expense of the Contractor, and the Contractor and the surety shall be liable to the County for any excess cost occasioned the County thereby. In such event, the County may without liability for so doing, take possession of and utilize in completing the Project, such materials, appliances and other property belonging to the Contractor as may be on the site of the Project and necessary therefore. In such case the Contractor shall not be entitled to receive any further payment until the Project is finished. If the unpaid balance of the contract sum shall exceed the expense of finishing the Project, including compensation for additional managerial and administrative services, such excess shall be paid to the Contractor. If such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the County.

ARTICLE 11 - PERFORMING A PORTION OF THE WORK: If the Contractor fails to correct defective work or persistently fails to carry out the work in accordance with the Contract Documents, the County, by written order, may order the Contractor to stop the work, or any portion thereof, until the cause of such order has been eliminated. The County shall not have any duty to stop the work for the benefit of the Contractor or any other person or entity. If the County chooses to correct or carry out the work itself, it shall normally give the Contractor seven (7) days after providing written notice to commence and continue correction of such default or neglect with diligence and promptness. If, however, the condition constitutes an emergency which may subject the County to penalties or termination of the Project by outside jurisdictional agencies, the County may do so without notice to the Contractor. In either case, an appropriate change order shall be issued, deducting, from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Project Manager's and consultants' additional services made necessary by such default, neglect, or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor and its surety shall pay the County the difference.

ARTICLE 12 - USE OF SUBCONTRACTORS: Contractor agrees that, as required by State law and the Instruction to Bidders, all subcontractors which will perform work on this project shall be listed on the Designation of Subcontractors form, provided with the Contract Documents.

ARTICLE 13 - PREVAILING WAGE RATES: In accordance with the provisions of section 1720, *et seq*., of the California Labor Code, the Director of the California Department of Industrial Relations has determined the general prevailing rates or wages and employer payments for health and welfare, pension, vacation, travel time, and subsistence pay as provided for in section 1770, *et seq.,* of the California Labor Code. **Pursuant to the California Labor Code, the general prevailing rate of per diem wages and for holiday and overtime work shall be paid to all workers employed by the Contractor selected for this project. Copies of prevailing rates of per diem wages are available upon request at the County's Offices or at www.dir.ca.gov. If this project is state funded, the Department of Industrial Relations will monitor and enforce compliance with applicable prevailing wage requirements on this project through the Compliance Monitoring Unit (CMU) and enforce compliance with applicable prevailing wage requirements in accordance with the California Labor Code, including sections 1771, 1774, 1776, 1777.5, 1813, and 1815. Further information regarding this requirement is available at https://www.dir.ca.gov/t8/16450.html.**

Contractor may be responsible for paying subcontractors' employees' prevailing wages if it does not comply with the provisions of Labor Code sections 1770, *et seq.*

The Contractor and each subcontractor shall keep or cause to be kept an accurate record showing the names and occupations of all laborers, workers and mechanics employed by it in connection with the execution of this Agreement or any subcontract thereunder, and showing also the actual per diem wage paid to each of such workers, which records shall be open at all reasonable hours to inspection by the County, its officers and agents and to the representatives of the Division of Labor Standards Enforcement of the State Department of Industrial Relations (DIR). Attention is directed to the provisions in section 1777.5 and section 1777.6 of the Labor Code concerning the employment of apprentices by the Contractor or any subcontractor under it.

Pursuant to Senate Bill (SB) 854, Contractor will electronically submit certified payroll records to the Labor Commissioner/DIR unless the Labor Commissioner excuses Contractor from this requirement. The parties understand and agree that the project will be subject to compliance monitoring and enforcement by the DIR.

This Agreement may be subject to a labor compliance program, as described in Section 1771.5 of the Labor Code. As required by law, the Department of Industrial Relations will monitor and enforce compliance with applicable prevailing wage requirements.

ARTICLE 14 - WORKING HOURS: In accordance with the provisions of the California Labor Code, eight (8) hours labor shall constitute a day's work, and no laborer, workman or mechanic in the employ of the Contractor, or any subcontractor, doing or contracting to do any part of the work contemplated by this Agreement, shall be required to or permitted to work more than eight (8) hours in one calendar day or forty (40) hours during any one calendar week unless such work is compensated at the lawful overtime rate set forth in the California Labor Code. The Contractor and each subcontractor shall also keep an accurate record showing the names and actual hours worked of all workers employed by it in connection with the work contemplated by this Agreement, which record shall be open at all reasonable hours to the inspection of the County, or its officers or agents and to the Chief of the Division of Labor Standards Enforcement of the DIR, its deputies or agents; and it is hereby further agreed that Contractor shall forfeit as a penalty to the County the sum of twenty-five dollars ($25.00) for each laborer, workman or mechanic who is required or permitted to labor more than eight (8) hours a day or forty (40) hours a week in violation of this Article 14.

ARTICLE 15 - EMPLOYMENT OF APPRENTICES: Contractor agrees to comply with all provisions of the law regarding the employment of apprentices, including, but not limited to Labor Code §§ 1773.3, 1777.5, 1777.6 and 3077, *et seq*. These sections require that contractors and subcontractors employ apprentices

in apprenticeable occupations in a ratio of not less than one (1) apprentice hour for each five (5) journeyman hours, unless an exemption is granted, and that contractors and subcontractors shall not discriminate among otherwise qualified employees as indentured apprentices on any public work on the grounds of race, religious creed, color, national origin, ancestry, sex, or age. Only apprentices who are in training under written apprenticeship agreements will be employed on public works in apprenticeable occupations. The responsibility for compliance with these provisions for all apprenticeable occupations rests with the Contractor.

ARTICLE 16 – INSURANCE: The Contractor shall procure and maintain for the duration of this Contract and for two years thereafter, 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, and Contractor's agent, representatives, employees, or subcontractors. Contractor shall include in all of its contracts with Subcontractors provisions requiring such Subcontractors to meet the same insurance requirements as set forth herein.

Comprehensive or commercial general liability (CGL) insurance, on Insurance Office Services Form CG 00 01 (or a form at least as broad as Form CG 00 01) covering CGL on an "occurrence" basis, including products and completed operations, property damage, bodily injury and personal and advertising injury with limits no less than $1,000,000 per occurrence. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this Project and location or the general aggregate limit shall be twice the required occurrence limit.

Automobile Liability Insurance, on Insurance Services Office Form Number CA 0001 covering Code 1 (any auto) with limits no less than $5,000,000 per accident for bodily injury and property damage.

Workers' Compensation, including Employers' Liability Insurance, as required by the State of California with Statutory Limits, and Employers' Liability insurance with a limit of no less than $1,000,000 each accident, injury or disease. The Contractor shall require subcontractors to provide workers' compensation insurance for all subcontractors' employees engaged in Work under the subcontract. Any class of employee or employees not covered by a subcontractor's insurance shall be covered by the Contractor's insurance. If the Contractor fails to maintain such insurance, the County, at its sole option and without incurring any further obligation to provide insurance, may take out Workers' Compensation insurance to cover any compensation payable under the provisions of the Act by reason of any employee of the Contractor or a subcontractor being injured or killed, and to deduct the amount of the premium for such insurance from any sums due the Contractor. If injury occurs to any employee of the Contractor for which the employee, or its dependents in the event of its death, is entitled to compensation from the County under the provisions of said Act, or from the sums due the Contractor under these Contract Documents the County may deduct and retain an amount sufficient to cover such compensation or payment of such compensation.

The Contractor shall sign and file with the County the following certification prior to performing the Work of the Contract: "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 the Contract."

Fire insurance on all Work subject to loss or damage by fire. Contractor shall maintain fire insurance in an amount of fire insurance shall be sufficient to protect the Project and all appurtenant structures against loss of damage in full until the Work is accepted by the County.

Coverage for debris removal limits not less than $1,000,000. In the event that the Contractor is performing abatement of hazardous or contaminated materials work or employs a subcontractor or entity for abatement of hazardous or contaminated materials, environmental liability and pollution insurance, with limits not less than $1,000,000. The policy shall be written on an occurrence form and any deductible shall not exceed $25,000.

Minimum Amounts Required. The amounts of insurance coverage stated above are the minimums that Contractor is required to procure and maintain. If Contractor maintains higher limits than the minimums stated above, the County requires, and shall be entitled to, coverage for the higher limits maintained by the

Contractor. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the County.

Deductibles and Self-Insured Retentions. Any deductibles or self-insured retentions must be declared to and approved by the County. At the option of the County, either the Contractor shall cause the insurer to reduce or eliminate such deductibles or self-insured retentions as respects the County, its officers, officials, employees and volunteers; or the Contractor shall provide a financial guarantee satisfactory to the County guaranteeing payment of losses and related investigations, claim administration, and defense expenses.

Required Endorsements. The insurance policies required in this Article 16 of this Agreement shall contain or shall be endorsed to contain the following provisions:

(a) The County, its officers, officials, employees, and volunteers are to be covered as additional insureds on the CGL policy with respect to liability arising out of work or operations performed by or on behalf of the Contractor, including materials, parts, or equipment furnished in connection with work or operation and automobiles owned, leased, hired, or borrowed by or on behalf of the Contractor. General liability coverage can be provided in the form of an endorsement to the Contractor's insurance (at least as broad as ISO Form CG 20 10, CG 11 85 or both CG 20 10 and CG 20 37 if later revisions are used);

(b) For any claims related to the Project, the Contractor's insurance coverage shall be primary insurance as respects the County, its officers, officials, employees, and volunteers. Any insurance or self-insurance maintained by the County, its officers, officials, employees, or volunteers shall be excess of the Contractor's insurance and shall not contribute to it; and

(c) Each insurance policy required by this Agreement shall provide that coverage shall not be canceled, except with prior written notice to the County.

Acceptability of Insurers: Insurance companies providing coverage required under this Agreement shall be legally licensed and admitted through the California Department of Insurance to engage in the business of furnishing insurance in the State of California. All insurance companies shall have an "A-VII" in Bests Rating Guide and shall be satisfactory to the County.

Waiver of Subrogation: Contractor hereby waives the right of subrogation which any insurer of Contractor may acquire from Contractor by virtue of payment of any loss. Contractor agrees to obtain any endorsement that may be necessary to affect this waiver of subrogation. The Workers' Compensation policy shall be endorsed with a waiver of subrogation in favor of the County for all work performed by the Contractor, its employees, agents, and subcontractors.

In the event of any damage, not insured by the County, as identified in this agreement under Builder's Risk/All Risk section, it shall be the Contractor's responsibility to perform at its expense all required repair and replacement including damage to adjacent areas.

Verification of Coverage. Before commencement of the Work under this Agreement, certificates of insurance shall be furnished to the County, with complete copies of policies to be furnished to the County promptly upon request. All policies of insurance, exclusions, deductibles, self-insured retentions, and certificates shall be reviewed by, and satisfactory to the County before Contractor commences work on the Project. Approval of the insurance by the County shall not relieve or decrease the extent to which the Contractor or subcontractor of any tier may be held responsible for payment of any and all damages resulting from its action, inaction or operations. Further, failure by Contractor to obtain the required documents prior to work beginning on the Project shall not relieve the Contractor of the obligation to obtain them or constitute a waiver by the County of Contractor's obligation to provide them. The County reserves the right to require complete, certified copies of all required insurance policies, including endorsements, required by this Agreement, at any time.

Liability insurance shall be on an occurrence basis. The coverage afforded thereby shall be primary and non-contributory to any other existing valid and collectable insurance to the full limit of liability stated in the declaration, and such insurance shall apply separately to each insured against whom claim is made or suit

is brought, but the inclusion of more than one (1) insured shall not operate to increase the insurer's limits of liability.

Certificates of insurance shall state in particular those insured, the extent of insurance, location and operation to which the insurance applies, the expiration date, and cancellation and reduction notices. Certificates and insurance policies shall include the following clause: "This policy shall not be non-renewed, canceled, or reduced in required limits of liability or amounts of insurance until notice has been mailed to the County. Date of cancellation or reduction may not be less than thirty (30) days after the date of mailing notice." If, at any time during the life of this Agreement, the Contractor fails to maintain any item of the required insurance in full force and effect, all Work of this Agreement may, at the County's sole option, be discontinued immediately, and all payments due or that become due under the Agreement will be withheld, until notice is received by the County as provided hereinabove that such insurance has been restored to full force and effect and that the premiums therefrom have been paid for a period satisfactory to the County.

Any failure to maintain any item of the required insurance may, at County's sole option, be considered material breach of the Agreement and, in such an event, the County may immediately terminate this Agreement.

Subcontractors. Contractor shall require and verify that all subcontractors maintain insurance meeting all the requirements stated in this Agreement and Contractor shall ensure that the County is an additional insured on insurance required from subcontractors. For CGL coverage, subcontractors shall provide coverage with a format at least as broad as ISO Form CG 20 38 04 13.

Reservation of Rights to Implement Owner Controlled Insurance Program.

Notwithstanding the foregoing requirements set forth in this Article 16 of the Agreement, the County hereby reserves the right to modify the insurance requirements set forth in the Agreement, including but not limited to reserving the right to implement an Owner Controlled Insurance Program ("OCIP") for the Project.

In the event an OCIP is implemented, the OCIP will provide certain specified insurance coverages for County, and any Contractor or Subcontractor working on the Project who are eligible for, and are properly enrolled in the OCIP. The insurance coverages that may potentially be included in the OCIP include, but are not limited to, workers compensation insurance, commercial general liability insurance, and excess liability insurance. The selection of insurance coverages that may be included in the OCIP, and the limits, terms, and conditions of coverage, shall be established by the County, in its sole discretion. The coverages included in the OCIP will be identified by County, in writing, if and when the County decides to implement an OCIP for the Project.

In the event an OCIP is implemented, Contractor and any Subcontractor eligible for the OCIP shall be required to enroll in the OCIP. As part of the OCIP enrollment process, Contractor and each eligible Subcontractor shall be required to provide information to County, or its agents, sufficient to enable County to determine each Contractor's and Subcontractor's reduction in insurance costs due to enrollment in the OCIP. In order to enroll in the OCIP, Contractor and any eligible Subcontractor will be required to accept an insurance credit, either by accepting a deductive credit to their contract price, or by agreeing to exclude from their contract price an amount equal to their reduction insurance costs due to enrollment in the OCIP. The methodology and procedures for identifying the insurance credit, and enrolling in the OCIP, will be established in writing, by the County, if and when an OCIP is implemented.

In the event an OCIP is implemented, Contractor and all Subcontractors will still be required to maintain other insurance coverages that are not provided under the OCIP. For example, Contractor and Subcontractor will generally still be required to maintain off-site workers compensation, off-site commercial general liability, and commercial automobile liability insurance consistent with the terms of the Agreement, or as further directed by County.

ARTICLE 17 - INDEMNIFICATION AGAINST LIABILITY: Notwithstanding any other provision of the Contract Documents, Contractor agrees to indemnify, defend and save harmless the County, its Governing Board, related entities and divisions, officers, agents, consultants and employees from and against any and all claims, demands, losses, defense costs, or liabilities of any kind or nature which they may sustain or

incur or which may be imposed upon them for injury to or death of persons, damage to property, or delay or damage to another contractor, or for attorney's fees incurred in defending or prosecuting suits to enforce laws relating to public works contracts, resulting or arising out of, or in any manner connected with Contractor or Contractor's agents, employees or subcontractors' performance or failure to perform under the terms of the Contract Documents, excepting only liability arising out of the sole negligence or willful misconduct of the County. The parties stipulate that any such claims, demands, losses, defense costs, or liabilities would be above, beyond, and entirely separate from, those damages which would be liquidated pursuant to Article 6.

ARTICLE 18 - CONTRACT MATERIALS: At the end of this Agreement, or in the event of termination, all finished or unfinished documents, data, studies, maps, photographs, reports, and other written materials (collectively referred to as "contract materials") prepared by Contractor under this Agreement shall become the property of County and shall be promptly delivered to County. Upon termination, Contractor may make and retain a copy of such contract materials if permitted by law.

ARTICLE 19 - RELATIONSHIP OF PARTIES: Contractor agrees and understands that the work/services performed under this Agreement are performed as an independent contractor and not as an employee of County and that neither Contractor nor its employees acquire any of the rights, privileges, powers, or advantages of County employees.

ARTICLE 20 - ASSIGNABILITY AND SUBCONTRACTING: Contractor shall not assign this Agreement or any portion of it to a third party or subcontract with a third party to provide services required by Contractor under this Agreement without the prior written consent of County. Any such assignment or subcontract without County's prior written consent shall give County the right to automatically and immediately terminate this Agreement without penalty or advance notice.

ARTICLE 21 - COMPLIANCE WITH LAWS: All services to be performed by Contractor pursuant to this Agreement shall be performed in accordance with all applicable Federal, State, County, and municipal laws, ordinances, and regulations, including but not limited to the Health Insurance Portability and Accountability Act of 1996 (HIPAA) and the Federal Regulations promulgated thereunder, as amended (if applicable), the Business Associate requirements set forth in Attachment H (if attached), the Americans with Disabilities Act of 1990, as amended, and Section 504 of the Rehabilitation Act of 1973, which prohibits discrimination on the basis of disability in programs and activities receiving any Federal or County financial assistance. Such services shall also be performed in accordance with all applicable ordinances and regulations, including but not limited to appropriate licensure, certification regulations, provisions pertaining to confidentiality of records, and applicable quality assurance regulations. In the event of a conflict between the terms of this Agreement and any applicable State, Federal, County, or municipal law or regulation, the requirements of the applicable law or regulation will take precedence over the requirements set forth in this Agreement.

Further, Contractor certifies that it and all of its subcontractors will adhere to all applicable provisions of Chapter 4.106 of the San Mateo County Ordinance Code, which regulates the use of disposable food service ware. Accordingly, Contractor shall not use any non-recyclable plastic disposable food service ware when providing prepared food on property owned or leased by the County and instead shall use biodegradable, compostable, reusable, or recyclable plastic food service ware on property owned or leased by the County. (This paragraph may be deleted without County Counsel Review if not relevant to this agreement)

Contractor will timely and accurately complete, sign, and submit all necessary documentation of compliance.

ARTICLE 22 - NON-DISCRIMINATION AND OTHER REQUIREMENTS:

a. General Non-discrimination

No person shall be denied any services provided pursuant to this Agreement (except as limited by the scope of services) on the grounds of race, color, national origin, ancestry, age, disability (physical or

mental), sex, sexual orientation, gender identity, marital or domestic partner status, religion, political beliefs or affiliation, familial or parental status (including pregnancy), medical condition (cancer-related), military service, or genetic information.

b. Equal Employment Opportunity

Contractor shall ensure equal employment opportunity based on objective standards of recruitment, classification, selection, promotion, compensation, performance evaluation, and management relations for all employees under this Agreement. Contractor's equal employment policies shall be made available to County upon request.

c. Section 504 of the Rehabilitation Act of 1973

Contractor shall comply with Section 504 of the Rehabilitation Act of 1973, as amended, which provides that no otherwise qualified individual with a disability shall, solely by reason of a disability, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination in the performance of any services this Agreement. This Section applies only to contractors who are providing services to members of the public under this Agreement.

d. Compliance with County's Equal Benefits Ordinance

Contractor shall comply with all laws relating to the provision of benefits to its employees and their spouses or domestic partners, including, but not limited to, such laws prohibiting discrimination in the provision of such benefits on the basis that the spouse or domestic partner of the Contractor's employee is of the same or opposite sex as the employee.

e. Discrimination Against Individuals with Disabilities

The nondiscrimination requirements of 41 C.F.R. 60-741.5(a) are incorporated into this Agreement as if fully set forth here, and Contractor and any subcontractor shall abide by the requirements of 41 C.F.R. 60–741.5(a). This regulation prohibits discrimination against qualified individuals on the basis of disability and requires affirmative action by covered prime contractors and subcontractors to employ and advance in employment qualified individuals with disabilities.

f. History of Discrimination

Contractor certifies that no finding of discrimination has been issued in the past 365 days against Contractor by the Equal Employment Opportunity Commission, the California Department of Fair Employment and Housing, or any other investigative entity. If any finding(s) of discrimination have been issued against Contractor within the past 365 days by the Equal Employment Opportunity Commission, the California Department of Fair Employment and Housing, or other investigative entity, Contractor shall provide County with a written explanation of the outcome(s) or remedy for the discrimination prior to execution of this Agreement. Failure to comply with this Section shall constitute a material breach of this Agreement and subjects the Agreement to immediate termination at the sole option of the County.

g. Reporting; Violation of Non-discrimination Provisions

Contractor shall report to the County Manager the filing in any court or with any administrative agency of any complaint or allegation of discrimination on any of the bases prohibited by this Section of the Agreement or the Section titled "Compliance with Laws". Such duty shall include reporting of the filing of any and all charges with the Equal Employment Opportunity Commission, the California Department of Fair Employment and Housing, or any other entity charged with the investigation or adjudication of allegations covered by this subsection within 30 days of such filing, provided that within such 30 days such entity has not notified Contractor that such charges are dismissed or otherwise unfounded. Such notification shall include a general description of the circumstances involved and a general description of the kind of discrimination alleged (for example, gender-, sexual orientation-, religion-, or race-based discrimination).

Violation of the non-discrimination provisions of this Agreement shall be considered a breach of this Agreement and subject the Contractor to penalties, to be determined by the County Manager, including but not limited to the following:

i. termination of this Agreement;

ii. disqualification of the Contractor from being considered for or being awarded a County contract for a period of up to 3 years;

iii. liquidated damages of $2,500 per violation; and/or

iv. imposition of other appropriate contractual and civil remedies and sanctions, as determined by the County Manager.

To effectuate the provisions of this Section, the County Manager shall have the authority to offset all or any portion of the amount described in this Section against amounts due to Contractor under this Agreement or any other agreement between Contractor and County.

h. Compliance with Living Wage Ordinance

As required by Chapter 2.88 of the San Mateo County Ordinance Code, Contractor certifies all contractor(s) and subcontractor(s) obligated under this contract shall fully comply with the provisions of the County of San Mateo Living Wage Ordinance, including, but not limited to, paying all Covered Employees the current Living Wage and providing notice to all Covered Employees and Subcontractors as required under the Ordinance. (If LWO is not applicable to this contract, you may delete this section without County Counsel review. Contact your assigned County Counsel if you are unsure if LWO is applicable)

ARTICLE 23 - COMPLIANCE WITH COUNTY EMPLOYEE JURY SERVICE ORDINANCE: Contractor shall comply with Chapter 2.85 of the County's Ordinance Code, which states that Contractor shall have and adhere to a written policy providing that its employees, to the extent they are full-time employees and live in San Mateo County, shall receive from the Contractor, on an annual basis, no fewer than five days of regular pay for jury service in San Mateo County, with jury pay being provided only for each day of actual jury service. The policy may provide that such employees deposit any fees received for such jury service with Contractor or that the Contractor may deduct from an employee's regular pay the fees received for jury service in San Mateo County. By signing this Agreement, Contractor certifies that it has and adheres to a policy consistent with Chapter 2.85. For purposes of this Section, if Contractor has no employees in San Mateo County, it is sufficient for Contractor to provide the following written statement to County: "For purposes of San Mateo County's jury service ordinance, Contractor certifies that it has no full-time employees who live in San Mateo County. To the extent that it hires any such employees during the term of its Agreement with San Mateo County, Contractor shall adopt a policy that complies with Chapter 2.85 of the County's Ordinance Code." The requirements of Chapter 2.85 do not apply if this Agreement's total value listed in the Section titled "Payments", is less than one-hundred thousand dollars ($100,000), but Contractor acknowledges that Chapter 2.85's requirements will apply if this Agreement is amended such that its total value meets or exceeds that threshold amount.

ARTICLE 24 - PAYMENT OF PERMITS/LICENSES: Contractor bears responsibility to obtain any license, permit, or approval required from any agency for work/services to be performed under this Agreement at Contractor's own expense prior to commencement of said work/services. Failure to do so will result in forfeit of any right to compensation under this Agreement.

ARTICLE 25 - ACCOUNTING/RETENTION OF RECORDS:

a. Contractor shall maintain all required records relating to services provided under this Agreement for three (3) years after County makes final payment and all other pending matters are closed, and the Contractor shall be subject to the examination and/or audit by County, a Federal grantor agency, and the State of California.

b. Contractor shall comply with all program and fiscal reporting requirements set forth by applicable Federal, State, and local agencies and as required by County.

c. Contractor agrees upon reasonable notice to provide to County, to any Federal or State department having monitoring or review authority, to County's authorized representative, and/or to any of their respective audit agencies access to and the right to examine all records and documents necessary to determine compliance with relevant Federal, State, and local statutes, rules, and regulations, to determine compliance with this Agreement, and to evaluate the quality, appropriateness, and timeliness of services performed.

ARTICLE 26 - MISCELLANEOUS PROVISIONS:

a. Entire Agreement: This Agreement constitutes the entire agreement between the parties, and supersedes any prior agreement between the parties, oral or written, including the County's award of the Project to Contractor, unless such agreement is expressly incorporated herein. The County makes no representations or warranties, express or implied, not specified in this Agreement.

b. Execution of Other Documents: The parties to this Agreement shall cooperate fully in the execution of any and all other documents and in the completion of any additional actions that may be necessary or appropriate to give full force and effect to the terms and intent of this Agreement.

c. Execution in Counterparts: This Agreement may be executed in counterparts such that the signatures may appear on separate signature pages. A copy, or an original, with all signatures appended together, shall be deemed a fully executed agreement.

d. Binding Effect: Contractor, by execution of this Agreement, acknowledges that Contractor has read this Agreement, understands it, and agrees to be bound by its terms and conditions. This Agreement shall inure to the benefit of and shall be binding upon the Contractor and the County and their respective successors and assigns.

e. Severability: If any provision of this Agreement shall be held invalid or unenforceable by a court of competent jurisdiction, such holding shall not invalidate or render unenforceable any other provision hereof.

f. Amendments: The terms of this Agreement shall not be waived, altered, modified, supplemented or amended in any manner whatsoever except by written agreement signed by the parties.

g. Assignment of Agreement: The Contractor shall not assign or transfer by operation of law or otherwise any or all of its rights, burdens, duties or obligations without the prior written consent of the surety on the payment bond, the surety on the performance bond and the County.

h. Written Notice: Written notice shall be deemed to have been duly served if delivered in person to the individual or member of the firm or to an officer of the corporation for whom it was intended, or if delivered at or sent by registered or certified mail or courier to the last business address known to it who gives the notice.

i. Electronic Signature. Both County and Contractor wish to permit this Agreement and future documents relating to this Agreement to be digitally signed in accordance with California law and County's Electronic Signature Administrative Memo. Any party to this Agreement may revoke such agreement to permit electronic signatures at any time in relation to all future documents by providing notice pursuant to this Agreement.

j. Controlling Law; Venue. The validity of this Agreement and of its terms, the rights and duties of the parties under this Agreement, the interpretation of this Agreement, the performance of this Agreement, and any other dispute of any nature arising out of this Agreement shall be governed by the laws of the State of California without regard to its choice of law or conflict of law rules. Any dispute arising out of this Agreement shall be venued either in the San Mateo County Superior Court or in the United States District Court for the Northern District of California. In the event of breach or other dispute arising out of this

Agreement, County reserves the right to pursue all remedies, legal, contractual, administrative or otherwise against Contractor, including the recovery of any sanctions and penalties authorized by law.

IN WITNESS WHEREOF the parties have executed this Agreement on the date first hereinabove written.

CONTRACTOR,
(By signing below, also certifies awareness of and compliance with Labor Code Sections 1861 and 3700 concerning Worker's Compensation Law.)

By: _____ _____
Signature Date

Type or Print Name: _____

Official Capacity: _____ (Affix Corporate Seal)

By: _____ _____
Signature Date

Type or Print Name: _____

Official Capacity: _____

County of San Mateo

By: _____ _____
Mr. David Pine Date
President of the Board of Supervisors

County of San Mateo - Attestation

By: _____ _____
Mr. Mike Callagy Date
County Executive Officer

Note to Contractor:

a. For corporations, the contract must be signed by two officers. The first signature must be that of the chairman of the board, president or vice president; the second signature must be that of the secretary or chief financial officer. The signatures must be acknowledged by a Notary Public and seal attached.

b. If Partnership, all partners should sign under the partnership name. The signatures must be acknowledged by a Notary Public and seal attached.

PERFORMANCE BOND

County of San Mateo ("County") and _____ ("Contractor") have entered into a contract for the furnishing of all materials and labor, services and transportation which are necessary, convenient, and proper to construct:

County of San Mateo Department of Public Works

Realize Flood Park Project – Phase One

WHEREAS, the Agreement between the County and the Contractor dated _____, 20__, and all of the documents attached to or forming a part of the Contract Documents, are hereby referred to and made a part hereof; and

WHEREAS, the Contractor is required by the Agreement, before entering upon the performance of the work, to file a good and sufficient bond with the County to ensure Contractor's good and faithful performance thereunder.

NOW, THEREFORE, the Contractor and _____ ("Surety"), as Corporate Surety, hereby bind themselves, their heirs, executors, administrators, successors, or assigns, jointly and severally, unto the County in the sum of _____ Dollars ($_____), to be paid to the County upon the occurrence of the condition set forth below.

THE CONDITION OF THIS OBLIGATION IS that if the Contractor shall fail to well and truly perform and fulfill all the undertakings, covenants, terms, and conditions of the Agreement during the original term of the Agreement and any extensions thereof that may be granted by the County, and during the life of any guaranty required under the Agreement, or shall fail to well and truly perform and fulfill all the undertakings, covenants, terms, and conditions of any and all duly authorized modifications to the Agreement that may hereafter be made, then the Surety shall indemnify the County for any damage or loss suffered thereby. In case suit is brought upon this bond the Surety shall pay all court costs, expenses and reasonable attorney's fees.

IT IS HEREBY EXPRESSLY STIPULATED AND AGREED that no change, extension of time, alteration, or addition to the terms of the contract or the work to be performed thereunder or the specifications accompanying the same, shall in any way diminish the Surety's obligation on this bond, and the Surety does hereby waive notice of any such change, extension, alteration, or addition.

SHOULD THE CONDITION of this bond be fully performed, this obligation becomes void; otherwise the obligation shall remain in full force and effect.

IN WITNESS WHEREOF, this instrument has been duly executed by the Contractor and Surety this _____ day of _____, 20__.

(Notary Seal)

_____
(Principal)

_____
(Business Address)
_____

_____

_____
(Corporate Surety)

By: _____

_____
(Business Address)
_____

The rate or premium of this bond is _____ per Thousand Dollars; the total amount of premium charged, $_____.

(The above must be filled in by Corporate Surety).

PAYMENT BOND
(Labor and Material)

County of San Mateo ("County") and _____ ("Principal") have entered into a contract for the furnishing of all materials and labor, services and transportation, necessary, convenient, and proper to construct:

County of San Mateo Department of Public Works

Realize Flood Park Project – Phase One

WHEREAS, the Agreement between the County and the Principal dated _____, 20__, and all of the documents attached to or forming a part of the Contract Documents, are hereby referred to and made a part hereof; and

WHEREAS, the Principal is required by the Agreement, before entering upon the performance of the work, to file a good and sufficient bond with the body by whom the contract is awarded to secure the claims arising under the Agreement.

NOW, THEREFORE, the Principal and the undersigned _____ ("Surety"), as Corporate Surety, hereby bind themselves, their heirs, executors, administrators, successors, or assigns, jointly and severally, unto the County for the use and benefit of all persons provided under Civil Code section 9554, subdivision (b), in the sum of _____ Dollars ($_____).

THE CONDITION OF THIS OBLIGATION IS that if the Principal or a subcontractor, or their heirs, executors, administrators, successors, or assigns fails to pay any of the persons named in Civil Code section 9100, or any of the amounts due as specified in Civil Code section 9554, subdivision (b), Surety will pay the same in an amount not exceeding the amount hereinabove set forth. Additionally, Surety shall pay all court costs, expenses and reasonable attorneys' fees as fixed by the Court associated with any suit brought upon this bond, including costs and attorneys' fees incurred by the County.

IT IS HEREBY EXPRESSLY STIPULATED AND AGREED that this bond shall inure to the benefit of any and all persons, companies, and corporations entitled to file claims so as to give a right of action to them or their assigns in any suit brought upon this bond.

IT IS FURTHER EXPRESSLY STIPULATED AND AGREED that no change, extension of time, alteration, or addition to the terms of said contract or the specifications accompanying the same, shall in any manner diminish the Surety's obligations on this bond, and the Surety does hereby waive notice of any such change, extension, alteration, or addition.

SHOULD THE CONDITION of this bond be fully performed, then this obligation shall become void; otherwise the obligation shall be and remain in full force and effect.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and Surety this _____ day of _____, 20__.

(Notary Seal)

_____
(Principal)

_____
(Business Address)
_____

_____

_____
(Corporate Surety)

By: _____

_____
(Business Address)
_____

The rate or premium of this bond is _____ per thousand; the total amount of premium charged, $_____.

(The above must be filled in by Corporate Surety).

GENERAL CONDITIONS

Article 1 DEFINITIONS

1.1 Project Manager: Individual designated to represent the County. The term "County" shall also be defined to include the County's Representative. The Project Manager will be the Contractor's primary contact during construction of the Project.

1.2 Day: The term "day" as used in the Contract Documents shall mean calendar day.

1.3 CO: Change Order.

1.4 COR: Change Order Request.

1.5 Submit/Submission: An application for payment, request for information, substitution, or change order or requests for approval of samples or submittals or shop drawings. Includes resubmission after initial denial or direction to provide additional information.

1.6 Beneficial Occupancy: Notwithstanding any common law principal to the contrary, occupancy by the County shall be "beneficial" when occupancy for teaching purposes is safe and convenient (considering all visual, sound, and odor factors); the Project is weather-tight, functional, and aesthetically pleasing; all portions of the Project (including finishes, painting, hardware, services, safety systems and utilities) are complete and operational; and any remaining punch list work may be conveniently and effectively performed after 3:30 p.m. and/or on weekends and can and shall be completed within the immediately subsequent twenty eight (28) days after such occupancy.

1.7 Substantial Completion: Substantial Completion is the stage in progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents, except for minor punch list items, that the building may be Beneficially Occupied.

1.8 Final Completion: The point at which Contractor fully completes all contract work including punch list work and has submitted closeout documentation to the satisfaction of the County and Project Manager.

Article 2 CONTRACT DOCUMENTS.

2.1 The Contract Documents are the following:

1. Agreement
2. Bid Form
3. Bid Bond
4. Payment Bond
5. Performance Bond
6. Insurance Forms
7. Notice to Bidders and Instructions
8. Designation of Subcontractors Form
9. Non-Collusion Affidavit
10. Iran Contracting Act Certification
11. General and Special Conditions
12. Conditional Waiver and Release Upon Progress Payment for General Contractor
13. Conditional Waiver and Release Upon Progress Payment for Subcontractor (when requested)

14. Unconditional Waiver and Release Upon Progress Payment for General Contractor
15. Unconditional Waiver and Release Upon Progress Payment for Subcontractor (when requested)
16. Conditional Waiver and Release Upon Final Progress Payment for General Contractor
17. Conditional Waiver and Release Upon Final Progress Payment for Subcontractor
18. Contractor's Affidavit of Release of Liens
19. Consent of Surety Company to Final Payment
20. Contractor's Affidavit of Payment of Debts and Claims
21. Contractor's Affidavit of Payment of Prevailing Wage
22. Subcontractor's Affidavit of Payment of Prevailing Wage
23. Supplementary Conditions (if applicable)
24. Plans and Specifications and Drawings
25. County's Schedule of Milestones
26. Other Forms and Attachments (if applicable)
27. Addenda or Clarifications to any of the above

2.2 The County must approve any additions to the listed Contract Documents. Any modification amending or extending the Work covered by the Contract Documents shall be as binding as if originally included in the Contract Documents.

2.3 The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. The intention of the documents is to include all labor, materials, equipment, and other items necessary for the proper execution, completion, and operation of the Project. It is not intended that work not covered under any heading, section, branch, class, or trade of the specifications shall be supplied unless it is required elsewhere in the Contract Documents or is reasonably inferable therefrom as being necessary to produce the intended results. Words which have well-known technical or trade meanings are used herein in accordance with such recognized meanings.

2.4 The organization of the specifications into divisions, sections, and articles, and the arrangement of drawings shall not control the Contractor in dividing the Project among subcontractors or in establishing the extent of work to be performed by any trade. Neither the stated description nor the division of the Plans and Specifications to various sections, which is done solely for convenience, shall be deemed to limit the work required, divide or indicate it by labor jurisdiction or trade practice, or set up any bidding barriers to the various sub-contractors or suppliers.

2.5 The Contractor shall be responsible for the proper execution of all work required by the Contract Documents and for allocating such portions as it sees fit to the various sub-contractors. The Contractor is cautioned that the various individual sections may not contain all work that the Contractor may wish to allocate to a particular sub-contractor or everything bearing on the work of a particular trade, some of which may appear in other portions of the Plans or Specifications.

2.6 Intent of Drawings and Specifications.

2.6.1 The Contractor shall make its own layout of lines and elevations and shall be responsible for the accuracy of both its and the subcontractors' work resulting therefrom. All dimensions affecting proper fabrication and installation of all contract Work must be verified prior to fabrication by taking field measurements of the true conditions. The Contractor shall take, and assist subcontractors in taking, all field dimensions required in performance of the work, and shall verify all dimensions and conditions on the site. If there are any discrepancies between dimensions in drawings and existing conditions which will affect the work, the Contractor shall bring such discrepancies to the attention of the Project Manager

for adjustment immediately and in any case before proceeding with the Work. The Contractor shall be responsible for the proper fitting of all Work and for the coordination of all trades, subcontractors and persons engaged upon this Contract.

2.6.2 It is the intent of the Contract Plans and Specifications to show and describe complete installations. Items shown but not specified, or specified but not shown, shall be included unless specifically omitted. These Plans and Specifications shall be deemed to include and require everything necessary and reasonably incidental to the completion of all work described and indicated on the drawings, whether or not particularly mentioned or shown.

2.6.3 The specifications and drawings are intended to be explanatory of each other. Any work shown on the drawings, and not in the specifications, or vice versa, is to be treated as if indicated in both. In the case of conflict or inconsistency, the Supplementary Conditions (if any) shall control over the General Conditions and the specifications shall control over the drawings. In case of conflict within the drawings, larger scale drawings shall govern smaller scale drawings, written dimensions shall govern over scaled dimensions and figured dimensions shall control over scaled measurements. In all cases, the more costly or expensive interpretation is deemed to control and is to be the interpretation incorporated into the Contract Documents and Contract Sum.

2.7 Ambiguities, Errors, and Inconsistencies: If, in the opinion of the Contractor, the construction details indicated on the drawings or otherwise specified are in conflict with accepted industry standards for quality construction and therefore might interfere with Contractor's full guarantee of the Work involved, the Contractor shall promptly bring its opinion and the basis for it to the attention of the Project Manager for appropriate action before submittal of the bid. Contractor's failure to request clarification or interpretation of an apparent ambiguity, error or inconsistency waives that Contractor's right to thereafter claim any entitlement to additional compensation based upon an ambiguity, inconsistency, or error, which should have been discovered by a reasonably prudent Contractor, subject to the limitations of Public Contract Code §1104. During the Project, should any discrepancy appear or any misunderstanding arise as to the import of anything contained in the Contract Documents, the matter shall be promptly referred to the Project Manager, who will issue instructions or corrections.

2.8 Lines and Planes: All lines and planes appearing on Contract drawings to be horizontal or vertical and not explicitly indicated otherwise shall be constructed true and plumb. All lines and planes appearing on Contract drawings to intersect at right angles and not explicitly indicated otherwise shall be constructed at true right angles. Where details are indicated covering specific conditions, such details also apply to all similar conditions not specifically indicated.

2.9 Standards: The specification standards of the various sections of the Specifications shall be the procedural, performance, and material standards of the applicable association publications identified and shall be the required level of installation, materials, workmanship, and performance for the applicable work. Except where a specific date of issue is mentioned hereinafter, references to specification standards shall mean the edition, including amendments and supplements, in effect on the date of the Notice to Bidders for the Project. Where no standard is identified and a manufacturer is specified, the manufacturer's specifications are the standards. All standards shall be subordinate to the requirements of the applicable codes and regulations.

2.10 Reference to the Singular: Wherever in the Specifications an article, device or piece of equipment is referred to in the singular number, such reference shall include as many such items as are shown on drawings or required to complete the installation.

Article 3 PROJECT MANAGER

3.1 Nothing contained in the Contract Documents shall create any contractual relationship between the Project Manager and the Contractor.

3.1.1 References to; Owner's Representative, Construction Manager, Capital Program Management (CPM), or similar will be construed as references to The Project Manager as defined in this article.

3.1.2 For the purposes of this Contract, Mike Wasserman, AIA, LEED AP and Matthew Estes, PMP, CDT; representatives of Capital Program Management (CPM) are the Project Managers

3.2 The Project Manager will be the County's representative during construction and until final payment. Unless directed otherwise herein, all communications and correspondence from the Contractor shall be directed jointly to the Project Manager and the County.

3.3 The Project Manager shall at all times have access to the Project wherever it is in preparation and progress.

3.4 The Project Manager will make periodic visits to the Project site to familiarize themselves with the progress and quality of the work, determine in general if the Project is proceeding per the Contract Documents, and keep the County informed of its observations.

3.5 Based on such observations and the Contractor's applications for payment, the Project Manager will determine and verify the amounts owing to the Contractor and will issue recommendations for payment to the County as provided herein.

3.6 The Project Manager's decision in matters relating to artistic effect will be final if consistent with the intent of the Contract Documents.

3.7 The Project Manager will have authority to reject work which does not conform to the Contract Documents. Whenever, in its reasonable opinion, the Project Manager considers it necessary or advisable to ensure the proper implementation of the intent of the Contract Documents, it will have authority to require the Contractor to stop the Project or any portion thereof, or to require special inspection or testing of the work as provided herein whether or not such work be then fabricated, installed or completed. However, neither the authority to act under this subparagraph, nor any decision made by the Project Manager in good faith, either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of the Project Manager to the Contractor, any subcontractor, any of their agents or employees, or any other person performing any of the work.

3.8 Submittals.

3.8.1 All submittals are due within 60 calendar days of contract award. Long lead time items are required to accommodate project schedule. The Project Manager will monitor the submittal process. The Project Manager will review or take other appropriate action upon the Contractor's submittals, such as shop drawings, product data and samples, but only for the limited purpose of checking for conformance with the information given and design concept expressed in the Contract Documents. Contractor shall assume that the Project Manager may take as many as fourteen (15) work days to review submittals and shall include such review period in its Project schedule. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents.

3.9 The Project Manager will have authority to order minor changes in the Project after notifying the County. The Project Manager will prepare change orders in accordance with the Contract Documents. Upon a change order request by the County, the Contractor is to

submit a breakdown of all costs and/or credits incurred to accomplish the requested change. The breakdown is to be of sufficient detail to allow justification of additional costs and/or credits. All change orders shall be signed by the County, Project Manager, Engineer, and Contractor, and if applicable, must be approved by the County Building Department.

3.10 The Project Manager will conduct inspections to determine the dates of Substantial Completion and Final Completion. The Project Manager will receive written guarantees and waivers and related documents required of and assembled by the Contractor, and, upon review by the design team, will recommend issuance of a final certificate of payment.

3.11 The duties, responsibilities and limitations of authority of the Project Manager as the County's representative during construction as set forth in these General Conditions will not be modified without written consent of the County which the modification will be shown to the Contractor.

3.12 The Project Manager will not be responsible for the acts or omissions of the Contractor, or any subcontractors, or any of its agents or employees, or any other persons performing any of the work.

Article 4 THE COUNTY.

4.1 The County shall not be held responsible for delays caused by the period of time during which the County Building Department or any other state or local government agency reviews change order requests, requests for information or submittals unless (and then only to the extent to which) the County caused the delay.

4.2 Information and Services:

4.2.1 The County shall furnish all existing surveys describing the physical characteristics, known utility locations, legal limitations, and a legal description of the Project site.

4.2.2 Except as provided herein, the County shall secure and pay for necessary approvals, easements, assessments, and charges required for the construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

4.2.3 The County shall forward all instructions to the Contractor through the Project Manager.

4.2.4 The County will reimburse the Contractor with no additional markup for all fees required by the County Building Department.

4.3 County's Right to Carry Out the Work. If the Contractor defaults or neglects to carry out any portion of the work for the Project in accordance with the Contract Documents and fails within seven (7) days after receipt of written notice from the County to commence and continue correction of such default or neglect with diligence and promptness, the County may, without prejudice to any other remedy it may have, make good such deficiencies. In such case, an appropriate change order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the additional services of the Architect, and Engineers, and other representatives and consultants made necessary by such default, neglect, or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amount, County shall have the right to recover the difference from the Contractor or its sureties.

4.4 Use of Completed Parts of the Work before Acceptance.

4.4.1 Prior to Substantial Completion, whenever the work or any part thereof is in a condition making use thereof possible, and the best interest of the County requires such use, the County may take possession of, connect to, open for public use, or use the work or a part thereof. When so used, maintenance and repairs due to ordinary wear and tear or vandalism will be made at the County's expense.

4.4.2 The use by the County of the work or part thereof as contemplated in this section shall in no case be construed as constituting acceptance of the work or any part thereof and shall not constitute Substantial Completion until the County may take Beneficial Occupancy, as such is defined in these General Conditions. Such use shall neither relieve the Contractor of any of its responsibilities under the Contract nor act as a waiver by the County of any of the conditions thereof. Contractor shall continue to maintain all required insurance on the Project.

Article 5 CONTRACTOR.

5.1 Review of Contract Documents.

5.1.1 The Contractor shall carefully study and compare the Agreement, general conditions, drawings, specifications, addenda and modifications and shall at once report to the Project Manager any error, inconsistency or omission it may discover. The Contractor shall do no work without proper drawings and specifications or interpretations. If the Contractor performs any construction activity knowing it involves a recognized error, inconsistency or omission in the Contract Documents without such notice to the Project Manager, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.

5.1.2 The County will not be responsible for the cost of delays related to Contractor's failure to submit complete RFIs, submittals, or requests for substitution in sufficient time to receive a response prior to commencement of the related work.

5.1.3 The Contractor shall perform all the work and activities required by the Contract Documents and furnish all labor, materials, equipment, tools and appurtenances necessary to perform the work and complete it to the County's satisfaction within the time specified. The Contractor shall at all times perform the work of this Contract in a competent and workmanlike manner and, if not specifically stated, accomplish the work according to the best standards of construction practice. The Contractor in no way is relieved of any responsibility by the activities of the Project Manager, Architect, Engineer, or County Building Department in the performance of such duties.

5.1.4 Contractor shall make the layout of lines and elevations and shall be responsible for the accuracy of both the Contractor's and the Subcontractors' work resulting therefrom. All dimensions affecting proper fabrication and installation of all Contract work must be verified by the Contractor prior to fabrication and installation by taking field measurements of the true conditions. The Contractor shall take, and assist Subcontractors in taking, all field dimensions required in performance of the work, and shall verify all dimensions and conditions on the site. If there are any discrepancies between dimensions in drawings and existing conditions which will affect the work, the Contractor shall promptly bring such discrepancies to the attention of the Project Manager for adjustment before proceeding with the work. Contractor shall be responsible for the proper fitting of all work and for the coordination of all trades, Subcontractors and persons engaged upon this Contract.

5.1.5 Contractor shall do all cutting, fitting, or patching of Contractor's work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors as shown, or reasonably implied by, the drawings and Specifications

for the completed work. Any cost incurred by the County due to defective or ill-timed work shall be borne by the Contractor.

5.2 Personnel.

5.2.1 All persons working for Contractor and subcontractors on the Project will refrain from using profane or vulgar language, or any other language that is inappropriate if it were spoken by employees of the County, on the job site. The contractor will take all reasonable measures to ensure that its personnel and personnel of all subcontractors comply with this Section 5.2.1 of these General Conditions.

5.2.2 The Contractor shall employ a full-time, on-site, competent superintendent and necessary assistants who shall have complete authority to act for the Contractor on all matters pertaining to the work, who shall be designated in writing by the Contractor prior to commencement of work on the Project. The superintendent shall have a minimum of five (5) years of experience as the primary superintendent of similarly sized, similarly scoped projects. The superintendent shall be satisfactory to the County and, if not satisfactory, shall be replaced by the Contractor with one that is acceptable. The superintendent shall not be changed without the written consent of the County unless the superintendent ceases to be employed by the Contractor.

5.2.2.1 In the event that the superintendent is no longer employed by the Contractor, an immediate replacement is acceptable but must be submitted for review and approval by The County. If the county does not approve of the replacement, they may remain on-site with assistance from other Contractor personnel until a suitable replacement can be found.

5.2.3 The Contractor shall employ a competent estimator and necessary assistants, or contract for sufficient services of an estimating consultant who shall be designated in writing by the Contractor prior to commencement of work on the Project. The estimator shall have a minimum of five (5) years of experience in estimating. The estimator shall be satisfactory to the County and, if not satisfactory, shall be replaced by the Contractor with one that is acceptable. The estimator shall not be changed without the written consent of the County unless the estimator ceases to be employed by the Contractor.

5.2.4 The Contractor shall employ a competent scheduler and necessary assistants, or contract for sufficient services of a scheduling consultant who shall be designated in writing by the Contractor prior to commencement of work on the Project. The scheduler shall have a minimum of five (5) years of experience in scheduling. The scheduler shall be satisfactory to the County and, if not satisfactory, shall be replaced by the Contractor with one that is acceptable. The scheduler shall not be changed without the written consent of the County unless the scheduler ceases to be employed by the Contractor.

5.2.5 Contractor shall at all times enforce strict discipline and good order among Contractor's employees, and shall not employ on the Project any unfit person or anyone not skilled in the task assigned.

5.2.6 If the Contractor or any subcontractor on the Project site fails to comply with any provision of this paragraph 5.2 of these General Conditions, the County may have the non-complying person(s) immediately removed from the Project site. Such person(s) shall be replaced, at no additional expense to the County, within three (3) days of such removal. The Contractor, on behalf of it and its subcontractors, hereby waives any claim that the provisions of this paragraph or the enforcement thereof interferes, or has the potential to interfere, with its right to control the means and methods of its performance of its duties under this Contract.

5.3 Subcontractors.

5.3.1 Within ten (10) days of the date that the County executes the Agreement, the Contractor shall provide the Project Manager with signed contracts with all of its subcontractors (including those which need not be listed in the Bid), and a typed list of all subcontractors, which shall include the following information:

1. Address
2. Telephone and Facsimile numbers
3. Contractor's License Type and Number
4. Contractor's DIR Number
5. Contact Person
6. Portion of Work to be Performed
7. Subcontractor Bid Proposal
8. Contract Amount

5.4 The list shall be accompanied by proof of all required bonds to be carried by subcontractors.

5.4.1 If the Contractor elects to enter into any subcontract for any section of the work, the Contractor assumes all responsibility for ascertaining that the sub-contractor for the work is competent, solvent and thoroughly acquainted with all conditions of the work and has included all materials and appurtenances in connection therewith.

5.4.2 It shall be the responsibility of the Contractor to notify its Subcontractors of all portions of specifications or plans that the Contractor intends to include as part of the subcontract.

5.4.3 The Contractor shall insert the following language into all of its contracts with its subcontractors: "[Subcontractor's name] hereby warrants that it has reviewed all portions of [contractor's name]'s contract with the County, including all scheduling requirements. Such Contract Documents are hereby incorporated into this Agreement, and subcontractor shall be as responsible for carrying out the provisions thereof which relate to its scope of work as if it had contracted directly with the County."

5.4.4 The Contractor shall be responsible to its subcontractors for damages justifiably incurred by the subcontractors, including delay damages, except those which are caused by the action or inaction of that subcontractor or those with whom that subcontractor has contracted. The Contractor shall be responsible to the County for the acts and omissions of all employees, agents and all other persons performing any of the work on behalf of the Contractor or any subcontractor.

5.5 Communication Procedures.

5.5.1 The Contractor shall attend a mandatory Pre-Construction Conference, during which the County's Representative, Design Team, and Project Inspector shall review the Project reporting procedures and other requirements.

5.5.2 The Contractor shall meet weekly with the County's Representative, Design Team, and Project Inspector to review the project status. The Contractor shall provide copies of its superintendent's daily logs for the previous week, current project schedules and logs of outstanding submittals, requests for information, and requests for change orders (which shall include respective dates of submittal and required responses and shall designate the party whose response is pending).

5.5.3 The Project Manager will prepare minutes of the weekly construction meetings describing all agreements and commitments made (including who made them and when the commitments are to be fulfilled) and shall endeavor to distribute a copy to each required

attendee, whether its representative attended or not, within three (3) days. Attendees will have two (2) days after receipt of the minutes to advise the Design Team of any difference in understanding of what occurred at the meeting.

5.5.4 When the Contractor sends correspondence regarding samples, submittals, or shop drawings, Contractor shall send them to the Project Manager who will forward them onto the appropriate party(ies).

5.6 The Contractor shall supervise and direct the work, using its best skill and attention. It shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Project under the Contract Documents.

5.7 Timing of Design Team Review.

5.7.1 The Contractor shall provide a revised and updated Priority Schedule with each RFI and submittal. The Priority Schedule shall include a listing of pending requests, including the most current request, ranked in order of priority.

5.7.2 The Project Manager shall endeavor to respect the Contractor's requested order of priorities. The total response time is subject to the complexity of the RFIs and submittals, the number of RFIs or submittals submitted concurrently and any re-prioritization by the Contractor.

5.7.3 The County will not be responsible for the costs of delays related to Contractor's failure to submit RFIs, submittals, or requests for substitution in sufficient time to receive a response prior to commencement of the related work.

5.8 Shop Drawings, Product Data, Samples and Similar Submittals.

5.8.1 Shop Drawings are drawings, diagrams, illustrations, schedules, and other data that is specifically prepared by the Contractor or a subcontractor, sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the work.

5.8.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the work.

5.8.3 Samples are physical examples, which illustrate materials, equipment or workmanship, and establish standards by which the work will be judged.

5.8.4 Shop drawings, product data, samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the work for which submittals are required the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents.

5.8.5 All submittals shall be forwarded to the Project Manager within thirty (30) days of issuance of the Notice to Proceed if not requested earlier in the scope of work or supplementary conditions document. Contractor must make any request for extension of this time period within this time for any incomplete submittal. Any such request must include a schedule reflecting the anticipated submission, which incorporates adequate time for review and procurement, so as not to impede progress of the Project.

5.8.6 The Contractor shall perform no portion of the work requiring submittal and review of shop drawings, product data, samples or similar submittals until the respective submittal has been approved by the Project Manager. All such work shall be in accordance with approved submittals. In the event Contractor makes substitutions in materials, equipment, or designs without approval of the County and Design Team, the Contractor shall remove

the improper material and install the correct material and restore the area as if the unapproved substitution had never occurred.

5.8.7 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor thereby represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the work, Schedule, and Contract Documents.

5.8.8 Samples which are of value after testing will remain the property of the Contractor.

5.8.9 All requests for substitution shall be submitted the Project Manager no fewer than ten (10) days prior to the bid date. The Contractor shall clearly identify any request for substitution and provide sufficient product data to facilitate review by the Design Team. No substitutions will be considered for any board-approved County standard items.

5.9 Requests for Information.

5.9.1 The Contractor shall review any request for information prior to submission to the Project Manager to ensure that the information requested in such RFI is not already provided in the Contract Documents. RFIs shall contain information regarding any potential cost or schedule impacts. RFIs shall come only from the Contractor and not from any subcontractor.

5.10 Whenever the Contractor arranges to work at night, or at any time when work is not usually in progress, or to vary the period during which work is carried out each day, it shall obtain advance approval from the County. Such work shall be done without extra compensation to the Contractor, and such additional inspection costs shall be chargeable to the Contractor providing such work is not performed at the request of the County to meet an earlier completion time than that established in the Agreement.

5.11 The Contractor shall maintain at the site for the County one stamped copy of all drawings, specifications, addenda, approved shop drawings, change orders, and other modifications, in good order and marked to record all changes made during construction, which shall be available to the County's Representative, Design Team, and Project Inspector. The drawings, marked to record all changes made during construction, shall be delivered to the County upon completion of the Project.

5.12 Review of the Contractor's submittals shall not:

1. relieve the Contractor of any of the Contractor's obligations;
2. constitute approval of safety precautions, construction means, methods, techniques or procedures;
3. relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the Project Manager in writing of such deviation at the time of submission and the Project Manager has given written approval of such deviation; or
4. Indicate approval of an assembly of which the item is a component.

5.13 Temporary Office and Site Conditions.

5.13.1 The Contractor shall obtain County Approval for any space or area used for temporary facilities and staging requirements.

5.13.2 The Contractor shall obtain permits for, install and maintain in safe condition whatever scaffolds, hoisting equipment, barricades, walkways, or other temporary structures that

may be required to accomplish the work or pursuant to State or local regulations. Such structures shall be adequate for the intended use and capable of safely accepting all loads that may be imposed upon them. They shall be installed and maintained in accordance with all applicable federal, state and local codes and regulations.

5.14 Portable chemical toilets or water closets and urinals shall be provided by the Contractor for the use of its employees, trade contractors, subcontractors and their employees; and in no case shall the permanent plumbing fixtures of buildings on the site be used for such purpose without written consent of The Owner.

5.14.1 The Contractor shall promptly remove all such temporary facilities when they are no longer needed for the work or on completion of the project and shall make any necessary repairs caused by such use and removal.

5.14.2 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with any materials or equipment.

5.14.3 The Contractor will provide, at its expense, water and utilities, including telephone, including all connections and related charges.

5.14.4 The Contractor shall provide and maintain any and all facilities that may be required for dewatering in order that work may proceed on the project. If it is necessary for dewatering to occur continually, the Contractor shall have on hand whatever spare parts or equipment that may be required to avoid interruption of service.

5.14.5 The Contractor shall submit written request to the County for any utility shut downs no fewer than five (5) days prior to any utility (including, but not limited to, water, electricity, gas, and sewer) being disconnected or turned off, and shall inform the County of the anticipated duration of the unavailability of such utility.

5.15 Contractor's Safety Program.

5.15.1 Each Contractor who will perform work at the site shall prepare and submit to the County for general review a safety program, as required by the Contract Documents and all other governing laws and ordinances. The safety program, in addition to normal regulatory and statutory requirements of a safety program, will address the additional requirements to provide for the safety of anyone using the school site, to separate the construction area from the remaining school property, and to prohibit the use of school facilities by Contractor's employees unless specifically permitted otherwise.

5.15.2 The County, the Project Manager, the Design Team, and their representatives shall not be responsible for Contractor's implementation of or compliance with its safety programs, or for initiating, maintaining, monitoring or supervising the implementation of such programs or the procedures and precaution associated therewith, or for the coordination of any of the above with others at the site.

5.16 The Contractor shall perform all the work required by the Contract Documents and furnish all labor, materials, plant, equipment, tools and appurtenances necessary to perform said work and complete it within the time specified. The Contractor shall at all times perform the work of this Contract in a competent and workmanlike manner and, if not specifically stated, accomplish the work according to the best standards of construction practice.

5.17 Contractor shall do all cutting, fitting, or patching of its work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors as shown, or reasonably implied by, the Contract Plans and Specifications for the completed structure, and shall restore finishes to the satisfaction of the Project

Manager. Any cost caused by defective or ill-timed work shall be borne by the party responsible therefore.

5.18 The Contractor shall cooperate and coordinate with technical inspection and testing required of other contractors.

5.19 The Contractor shall submit Quality Control Reports as specified in Division 01 45 00 – Quality Control, and each Technical Specification section.

5.20 Instructions and Manuals.

5.20.1 Prior to Final Completion of the Project, the Contractor shall compile manufacturers' operations and maintenance manuals, warranties and guarantees, and certificates in PDF electronic copy in an organized manner. This information shall then be submitted to the Project Manager for approval at least three (3) months before the anticipated Project Completion Date.

5.20.2 The Contractor shall instruct the County's personnel in the operation and maintenance of the more complex equipment incorporated into the Project prior to final acceptance of the Project.

5.20.3 Receipt of complete instructions and manuals by the Design Team is a condition precedent to release of payments by the County to the Contractor.

5.20.4 All manufacturers' application/installation instructions shall be given to the Project Manager at least ten (15) work days prior to first material application or installation of the item.

5.21 The Contractor shall maintain at the work site a separate complete set of contract drawings which will be used solely for the purpose of recording changes made in any portion of the work during the course of construction, regardless of the reason for the change. As changes occur, there will be included or marked on this record set on a daily basis. Actual locations to scale shall be identified on the drawings for all runs of mechanical and electrical work, including all site utilities, etc., installed underground, in walls, floors, and furred spaces, or otherwise concealed. Deviations from the drawings shall be shown in detail. All main runs, whether piping, conduit, ductwork, drain lines, etc., shall be located in addition by dimension and elevation. Progress payments shall be withheld until such time as the record set is brought up to date.

5.22 The Contractor shall not unnecessarily interfere with use of any roadway, walkway or other facility for vehicular or pedestrian traffic at the Project site, by any party entitled to use it. Wherever such interference becomes necessary for the proper and convenient performance of the work and no satisfactory detour route exists, the Contractor shall, before beginning the interference, provide a satisfactory detour, temporary bridge, or other proper facility for traffic to pass around or over the interference, shall maintain it in satisfactory condition as long as the interference continues and shall coordinate and obtain the approval of the authority having jurisdiction over the affected right of way or property all without extra payment unless otherwise expressly stipulated in the Contract Documents.

5.23 Project Completion.

5.23.1 When the work to be performed under this Contract is completed to the point that the County can take Beneficial Occupancy, the Contractor shall notify the Project Manager in writing. The Contractor, Project Manager, Design Team, Project Inspector and subcontractor representatives shall thereafter inspect the work. As a result of this inspection, the Design Team will prepare a list of items that are incomplete or not installed

according to the Contract Documents (the "punch list"). Failure to include items on this list does not relieve the Contractor from fulfilling all requirements of the Contract.

5.23.2 After receipt of the “punch list” the Contractor shall have seven (7) days to make good, correct or otherwise properly address all items. If it is not feasible to complete all items within the stipulated time the Contractor shall immediately submit in writing a request for time extension including an explanation for such request. Should the Contractor not complete all items within the allotted time the County reserves the right to perform the work per section Article 11 of the Agreement.

5.23.3 On completion of all items on the punch list, verified by a final inspection, and all other Contract requirements, the County will issue a Notice of Acceptance to the Contractor and file a Notice of Completion with the County Recorder.

5.23.4 If, through no fault of the County, more than one inspection is required to determine whether the punch list has been completed, the Contractor will be back charged for the costs of the County’s representatives’ time, at the rate of Seven Hundred Fifty Dollars ($750) per additional inspection.

5.23.5 Final cleaning, such as sweeping, dusting, vacuuming, dry and wet mopping, polishing, sealing, waxing and other finish operations normally required on newly installed work shall be taken to indicate the required finished conditions of the various new and existing surfaces at the time of acceptance. At the time of acceptance, all marks, stains, fingerprints, dust, dirt, splattered paint and blemishes resulting from the various operations shall be removed in all areas of the Project. Stair treads and risers shall be wet-mopped. Glass, new and existing, shall be left clean and polished both inside and outside. Plumbing fixtures and light fixtures shall be washed clean. Hardware and other unpainted metals shall be cleaned and all building papers and other temporary protections shall be removed throughout the building, or portion of the building where Contractor was involved. Finally, the exterior of the buildings shall be pressure-washed prior to Beneficial Occupancy and the play field, courts, streets and planting spaces shall be clean and in good order. Such measures shall be taken to the satisfaction of the Project Manager.

5.23.6 Prior to Final Completion of the Project, the Contractor shall submit one set of as-built drawings on a clean set of plans for the Project Manager review and Design Team approval. This information shall then be submitted to the Project Manager for approval within twenty-eight (28) days of substantial completion.

5.24 The Contractor and subcontractors shall investigate and become aware of the amount of time required for the manufacture and delivery of all equipment and materials required to perform the work under this Contract. No extension of time or damages shall be granted due to failure to order said equipment and materials sufficiently before their incorporation into the work so as to avoid delay to the Project.

5.25 The Contractor and subcontractors shall provide and maintain sufficient labor, materials, and equipment to ensure a rate of construction progress that will complete the Project within the time specified and according to the schedule of work. If, in the County’s reasonable discretion, the Contractor and/or its subcontractors are not prosecuting the work at a sufficient rate of progress to meet the Project schedule, the County may direct the Contractor to (1) provide additional labor, materials or equipment; (2) work additional hours, holidays or weekends; and/or (3) contract with a Subcontractor without additional cost to the County until the work is progressing in a manner satisfactory to the County. Failure to prosecute the work in a timely manner and according to the Project schedule shall be a material breach of Contract and is cause for termination of the Contract pursuant to Article 10 of the Agreement between the parties.

5.26 If any person or subcontractor employed by the Contractor appears to the County to be incompetent, he shall be discharged immediately upon the request of the County, and such subcontractor or person shall not again be employed on the Project.

5.27 Contractor shall pay all sales, consumer, use and other similar taxes required by law and shall secure and pay for all permits, fees and licenses necessary for the execution of the Project.

5.28 The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by Contractor's operations. At the completion of the Project, Contractor shall remove all Contractor's waste materials and rubbish from and about the Project as well as Contractor's tools, construction equipment, machinery and surplus materials. If the Contractor fails to clean up, the County may do so and charge the cost to the Contractor.

Article 6 SEPARATE CONTRACTS.

6.1 County's Right to Award Separate Contracts.

6.1.1 The County reserves the right to award other contracts in connection with other portions of the Project under these or similar conditions.

6.1.2 When separate contracts are awarded for different portions of the Project, "the Contractor" in the Contract Documents in each case shall be the contractor who signs each separate contract.

6.2 Mutual Responsibility of Contractors.

6.2.1 The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work and shall properly connect and coordinate Contractor's work with theirs.

6.2.2 If Contractor's work depends for proper execution or results upon the work of any other separate contractor, the Contractor shall inspect and promptly report to the Project Manager any patent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor to inspect and report such shall constitute acceptance of the other contractor's work as fit and proper to receive work.

6.2.3 If, through acts of negligence on the part of this Contractor, any other contractor or subcontractor shall suffer loss or damage to the work, this Contractor shall make a reasonable effort to settle with such other contractor and subcontractor. If such other contractor or subcontractor shall assert any claim against the County, the Project Manager, or Design Team, on account of any damage alleged to have been so sustained, the County, the Project Manager, or Design Team shall notify this Contractor which shall defend such proceedings at its own expense and indemnify and save harmless the County, Project Manager, and Design Team from any such claim.

6.3 Cutting & Patching Under Separate Contracts.

6.3.1 The Contractor shall do all cutting, fitting, or patching of work that may be required to fit it to receive or be received by the work of other contractors shown upon, or reasonably implied by, the Contract Documents. The Contractor shall not endanger any work of any other contractors by cutting, excavating or otherwise altering any work and shall not cut or alter the work of any other contractor except with the written consent of the Project Manager and Design Team.

6.3.2 Any costs caused by defective or ill-timed work shall be borne by the party responsible therefore.

Article 7 PERFORMANCE AND PAYMENT BONDS.

7.1 In order to ensure that any Change Order work will be as fully bonded as work envisioned under the original Contract Documents, the Contractor shall provide, within five (5) days of the Execution Date of the Agreement, written proof, satisfactory to the County, that (1) it has pre-reserved bonding capacity in the amount of One Hundred Fifteen Percent (115%) of the Contract amount; or (2) its bonding company will bond any Change Order work which may be added to the Contract.

7.2 During the period covered by the Contract, if any of the sureties upon the bonds shall become insolvent or unable, in the opinion of the County, to pay promptly the amount of such bonds to the extent to which surety might be liable, the Contractor, within ten (10) days after notice given by the County to the Contractor, shall provide supplemental bonds or otherwise substitute another and sufficient surety approved by the County in place of the surety becoming insolvent or unable to pay. If the Contractor fails within such ten (10) day period to substitute another and sufficient surety, the Contractor shall, if the County so elects, be deemed to be in material breach of the Agreement and to be in default with respect to the payment bond, and the County, in addition to any and all other remedies, may terminate the Contract or bring any proper suit or other proceedings against the Contractor and the sureties or any of them, or may deduct from any monies then due or which thereafter may become due the Contractor under the Contract, the amount for which the surety, insolvent or unable to pay as aforesaid, shall have justified on the bonds, and the monies so deducted shall be held by the County as collateral security for the performance of the conditions of the bonds.

7.3 Corporate sureties on these bonds and on bonds accompanying bids must be admitted surety insurers as defined in California Code of Civil Procedure section 995.120(a), legally authorized to engage in the business of furnishing surety bonds in the State of California. All sureties and bond forms must be satisfactory to the County. Bond forms are furnished herewith.

Article 8 PAYMENTS AND COMPLETION.

8.1 Before the first application for payment, the Contractor shall submit to the Project Manager a schedule of values of the various portions of the Project, including quantities aggregating the total Contract Sum set forth in Article 5 of the Agreement, divided so as to facilitate payments to subcontractors, prepared in such form as specified, supported by such substantiating data as the Project Manager may require. Each item in the schedule of values shall include its proper share of overhead and profit. The schedule, when approved by the Project Manager and Design Team, shall be used as a basis for the Contractor's applications for payment under the terms of the Agreement. Should any scope of work be later deleted in its entirety by Change Order, the value of that work shall be as stated in the schedule of values.

8.2 Progress Schedules.

8.2.1 Contractor shall, prior to commencing construction and with each application for payment, submit to the Project Manager a Critical Path Method (CPM) schedule for the remainder of the Project showing anticipated beginning and ending dates for all critical path activities

and the logical connection between and among such activities. Any changes in logic on subsequent schedules must be noted.

8.2.2 If Contractor wishes to construct the Project in a shorter period of time than that stated in Article 4 of the Agreement, any difference between the Contractor's desired performance period and the stipulated performance period shall be incorporated into the schedule as float.

8.2.3 Either party responsible for an event or condition which delays the Project shall be entitled to take advantage of any remaining float in the Contractor's Progress Schedule at the discretion of the County.

8.2.4 Submission of schedules pursuant to this paragraph is a condition precedent to payment. Even if Contractor does not submit a Progress Payment Request, it must submit all other documents which are required to be submitted with the Request at the designated time.

8.3 Releases.

8.3.1 The Contractor shall submit the following with each specified application for payment.

8.3.1.1 Progress Payment. Contractor shall submit the following documents in support of all applications for a progress payment:

- Application for Payment on the standard AIA Form. (Each Application for Payment shall be consistent with previous applications and payments as certified by the Design Team and shall include any the signatures of the Project Manager and Project Inspector.)
- A conditional waiver and release upon progress payment from the General Contractor.
- An unconditional waiver and release upon progress payment from the General Contractor and, when requested, the General Contractor must supply an unconditional waiver and release for each subcontractor.
- Schedule of Values. (01 32 00 – Construction Progress Documentation;1.4)
- Certified Payroll for the General Contractor and all Subcontractors MUST be submitted as required under section 16461 of Title 8 of the California Code of Regulations and as may be required by any additional County and Project-specific requirements, which the County will inform Contractor of. As required under section 16461(b) of Title 8 of the California Code of Regulations, certified payroll for state funded projects shall be submitted to the Department of Industrial Relation’s Compliance Monitoring Unit at least monthly. The County and/or the Owner’s Representative will detail in writing any additional submittal requirements and such additional requirements shall be deemed incorporated herein by reference. Certified Payroll cannot be more than two weeks in arrears for each payment application submitted. At the end of the Project ALL certified payroll must be submitted before Final Retention is released. Contractor will cooperate with any efforts by the Compliance Monitoring Unit to confirm the accuracy of payroll records submitted by Contractor and will include in its contracts with subcontractors a requirement that such subcontractors will likewise cooperate.

Note: The Contractor understands and agrees that it is required to retain copies of all certified payroll records for this Project for a minimum of 3 years after project completion and the Contractor will include in its contracts with all subcontractors a requirement that they retain certified payroll records for this Project for a minimum of three years after project completion.

8.3.1.2. Final Progress Payment. Contractor will submit the following in support of an application for Final Progress Payment:

- All of the above documents listed as required under Section 8.3.1.1., above, for a "Progress Payment".
- A Conditional waiver and release upon FINAL progress payment from Contractor and each subcontractor.

8.3.1.3. Retention Payment. A Notice of Completion (NOC) will be filed after the County approves the Project as complete. Retention may be released, at a minimum, 31 days after filing of the NOC with the County Recorder.

- All of the above documents listed above under Section 8.3.1.1. as required for a "Progress Payment." (Note: Payment application MUST note "Final Retention")
- If an Escrow Account has been set up, a letter to the Escrow holder, requesting release of funds, MUST accompany this application.
- An Unconditional waiver and release upon FINAL progress payment from the Contractor and release of liens evidenced by an Affidavit of Release of Liens (see below).

The following Notarized Affidavits MUST be submitted with the Final Retention Payment Request

- Contractor's Affidavit of Release of Liens.
- Contractor's Affidavit of Payment of Debts and Claims.
- Consent of Surety Company to Final Payment
- Affidavit from the General Contractor certifying that during ALL payroll periods for ALL personal employed by Contractor under this project have been paid the specified prevailing rate as per diem wages and any amounts due pursuant to Section 1813 of the California Labor Code

8.3.2 An Affidavit, signed by each subcontractor, under penalty of perjury, that the subcontractor has paid the specified general prevailing rate of per diem wages to his or her employees on this public works project and any amounts due pursuant to Section 1813 (LC1775 (b)(4))

8.3.3 If the Contractor is unable to comply with paragraph 8.3 for an individual subcontractor due to a dispute about the subcontractor's quality of work or scope of work, the Contractor shall submit a statement to the Project Manager stating such, in lieu of that Waiver and Release.

8.4 Payments Withheld.

8.4.1 The Project Manager, Design Team, or County may also decline any applications for payment or, because of subsequently discovered evidence or subsequent inspections, may nullify the whole or any part of any certificate of payment previously issued to such extent as may be necessary, in its opinion to protect the County from loss because of, but not limited to:

1. defective work not remedied;
2. reasonable doubt that the Project can be completed for the unpaid balance of the Contract Sum;

3. reasonable indication that the Project will not be completed within the contract time;

4. unsatisfactory prosecution of the work by the Contractor;

5. Contractor's failure to pay subcontractors or materialmen;

6. damage to another contractor;

7. failure to provide waivers, schedules, labor compliance and other required documentation; or

8. Breach of any provision of the Contract Documents.

8.4.2 When any of the factors listed in Article 8.4 of these General Conditions resulting in withholding of payment is satisfactorily addressed by the Contractor, payment shall be made for amounts withheld because of them.

8.4.3 The granting of any progress payment or payments by the County or the receipt thereof by the Contractor, shall not constitute acceptance of the work or of any portion thereof, and shall in no way lessen the liability of the Contractor to replace unsatisfactory work or material.

8.4.4 It is mutually understood and agreed that when under any provision of this Agreement the County shall charge any sums of money against the Contractor, the amount of such charge shall be deducted and retained by the County from the amount of the next succeeding progress estimate, or from any other monies due or that may become due the Contractor on account of the Agreement. If on completion or termination of the Agreement such monies due the Contractor are found insufficient to cover the County's charges against it, the County shall have the right to recover the balance from the Contractor or its sureties.

8.5 Completion and Final Payment. Upon receipt of written notice that the Project is ready for final inspection and acceptance, and upon receipt of a final application for payment, less retention, the Project Manager, Project Inspector, and Design Team will promptly make such inspection. When the Project Manager finds the Project acceptable under the Contract Documents and the Agreement fully performed, the Project Manager will process the Contractor's final pay application and include a statement indicating that to the best of its knowledge, information, and belief, and on the basis of observations and inspections, the Project has been completed in accordance with the terms and conditions of the Contract Documents and that it recommends payment of the remainder of the Agreement balance.

Article 9 PROTECTION OF PERSONS AND PROPERTY.

9.1 Until Substantial Completion of the Project, the Contractor shall have the charge and care of all work, complete or incomplete, permanent or temporary, and of the materials to be used therein, including materials for which it has received partial payment.

9.2 The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury, or loss to the following until the work is accepted by the County:

1. all employees of the Contractor, subcontractors of every tier, and their respective agents, officers, employees or representatives on the Project and all other persons who may be affected thereby;

2. all the work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor, its subcontractors, sub-subcontractors or their officers, agents or employees; 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 construction.

9.3 If the Contractor encounters any facilities or utilities not shown on the drawing or reasonably inferable therefrom, it shall promptly notify the Project Manager, and it shall do no further work which may cause damage to same.

9.4 If it is determined that some action needs to be taken regarding facilities not shown, the Contractor will be given directives on what action to take, and any additional cost to the Contractor incurred thereby will be addressed through Change Order.

9.5 The Contractor shall obtain permits for, install and maintain in safe condition all barricades, walkways, fences, railings, and whatever other safeguards that may be necessary to protect persons and property from damage as a result of the construction under this Agreement.

9.6 Contractor shall not endanger any Project Work by cutting, excavating, or otherwise altering the Work and shall not cut or alter the work of any other Contractor except with the written consent of the Project Manager and the Design Team, nor overload any new or existing structures by the placing or storage of materials, equipment, or other items thereon. If necessary, Contractor shall provide calculations proving the safety in so doing.

9.7 If it is necessary to work at night, or where daylight is obscured, the Contractor shall provide and maintain lighting of adequate level to properly prosecute the work and to permit thorough inspection of same.

9.8 Contractor shall take extraordinary care to prevent fires and keep all flammable materials and oily rags in tightly closed metal containers. Contractor shall exercise particular care when welding or cutting, and with regard to the disposition of waste materials, the nature and quantity of which might create or increase a fire hazard.

9.9 The Contractor and each subcontractor of every tier shall supply to their respective employees and, where site is occupied, to the County, copies of Material Safety Data Sheets for hazardous substances that may be used in the course of the work, together with notice of actual hazardous substances to which employees may be exposed while performing work and appropriate protective measures.

9.10 Contractor shall secure the site, as well as all doors and windows thereon, prior to leaving the site each work Day. If Contractor fails to do so, the County may secure the site, doors, and windows itself, and may back charge Contractor for its associated costs.

9.11 When the Contractor's superintendent is not on site, the County may take all necessary steps to affect required emergency work and may back charge Contractor for the costs of such work.

9.12 Unless caused by the County’s willful act or sole negligence, the Contractor shall rebuild, repair, restore, and make good all injuries, losses, or damages to any portion of the work or the materials occasioned by any cause before its Final Completion and acceptance and shall bear the expense thereof. Should improper work of any trade be covered by another and damage or defects result, the whole work affected shall be made good to the satisfaction of the Project Manager, Design Team and the County without expense to the County.

9.13 Upon commencement of work and until Substantial Completion, Contractor assumes all risk of loss or damage to the Project arising from any cause save the sole negligence of the County.

Article 10 CHANGE ORDERS.

10.1 In addition to any statement governing change orders elsewhere in the Contract Documents, the Contractor and the County agree that changes in the Agreement or in the Project to be done under the Agreement shall become effective only when written in the form of supplemental agreement or change order and approved and signed by the Project Manager, the Design Team, and the Contractor and approved by the County and the County Building Department as applicable.

10.2 All Contractors are warned against acting on verbal instructions. If verbal instructions are necessary for expediting the work and are accepted by the Contractor, it shall then be the responsibility of the Contactor to obtain written instructions of the work involved conforming to the verbal instructions from the Project Manager issuing such verbal instructions. No work will be accepted by the County that differs from the Plans and Specifications that has not been approved pursuant to the required written approvals.

10.3 The Contractor shall not be entitled to any adjustment of the Contract Sum or Contract Time for extra work, without prior written approval or directive from the Design Team and/or the Project Manager. Failure to agree on an adjustment of the Contract Sum or Contract Time shall not excuse the Contractor from proceeding with the execution of the work as changed. If there is no agreement on cost, a construction change directive may be issued approving or directing that the work be compensated on a Force Account basis.

10.4 It is specifically agreed that the County shall have the right to direct any alterations, deviations, reductions, or additions to the Contract Documents and the amount of the cost thereof shall be added to or deducted from the amount of Contract Sum by fair and reasonable valuations.

10.5 If the Contractor wishes to make a claim for an increase in the Contract Sum, it shall submit a complete itemized estimate to the County written within seven (7) days after the occurrence of the event giving rise to such claim for increase. This Request for Change Order shall be given by the Contractor before proceeding to execute the work, except in an emergency endangering life or property. Failure to present such claim within the stipulated timeframe constitutes a waiver of such claim. Any change in the Contract Sum resulting from such claim shall be authorized by written Change Order.

10.6 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be assumed by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontracts. Labor and materials shall be itemized in a manner deemed acceptable by the Project Manager. Where major cost items are subcontracts, they shall be itemized also with backup documentation.

10.7 In determining the cost of any additive change order, Contractor agrees that the percentage markup for all overhead and profit shall be calculated as follows:

10.7.1 If the Contractor performs the work with its own forces, its percentage markup for overhead and profit shall not exceed ten percent (10%) of its hard costs.

10.7.2 If the Contractor performs the work through a subcontractor that is not owned or controlled by it, its percentage markup shall not exceed five percent (5%) of its subcontractor’s hard costs for such work.

10.7.3 If the Contractor performs the work through a subcontractor that is not owned or controlled by it, subcontractor's percentage markup shall not exceed ten percent (10%) of its subcontractor's hard costs for such work.

10.7.4 The total percentage markup on any change order shall not exceed ten percent (10%) of the actual cost of such work.

10.7.5 The above percentage markups for overhead and profit (including that for work performed by subcontractors) are understood to include Contractor's and subcontractor's site supervision costs, home office overhead, profit margin, insurance, general conditions, small tools, consumables, and all other factors. After the bonding capacity of one-hundred-fifteen percent (115%) of the contract value is reached; the actual cost of additional bond capacity, not to exceed two percent (2%) of the increased value of the Contract, shall be added to change orders.

10.8 Direct Cost of Materials: For all materials purchased by the Contractor and used in this specific Work, it shall receive the actual cost of such materials including freight charges, as shown by original receipted invoices for materials and freight.

10.8.1 If the actual costs, in the opinion of the Project Manager and/or Design Team, are excessive, or if the Contractor does not furnish satisfactory evidence of the cost of such materials from the actual supplier thereof, then the cost of such materials shall be deemed to be the lowest current wholesale price at which such materials are available in the quantities concerned delivered to the job site.

10.9 Direct Labor Costs: For all craft labor and foremen engaged in the specific operation, the Contractor shall receive the wage prevailing and paid on the project for each and every hour that said labor and foremen are actually engaged in such work, an amount equal to the Contractor's cost of Workmen's Compensation Insurance, Social Security taxes, Public Liability and Property Damage Insurance, and any and all fringe benefit costs required by prevailing wage agreement.

10.10 Direct Equipment Costs: For any machine, apparatus, or equipment which shall be deemed necessary or desirable to use, the Contractor shall be allowed a reasonable rental price, which shall be approved in writing before commencing such work, for each and every hour that said machinery, apparatus, or equipment is in use on such work.

10.10.1 Rental rates shall be deemed to include the cost of fuel, oil, lubrication, supplies, brooms or brushes, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, bonds and all incidentals.

10.10.2 A reasonable rental price for non-rented equipment will be the rental rates listed for such equipment in the California Department of Transportation publication entitled Labor Surcharge and Equipment Rental Rates (hereinafter "State Rental Rates"), which is in effect on the date upon which the work is accomplished. If it is deemed necessary to use equipment not listed in said publication, a suitable rental rate for such equipment shall be established by the Project Manager. The Contractor may furnish any cost data which might assist the Project Manager in the establishment of such rental rate.

10.10.3 A reasonable rental price for rented equipment shall be based on the actual and reasonable hourly rate shown on the rental agency invoice or agreement for the time used on force account work. If a minimum equipment rental amount is required by the local equipment rental agency, the actual amount charged will be paid to the Contractor. Approval for payment of rental equipment will be based on Contractor's paid vouchers approved by the Project Manager and Design Team. If the Contractor does not furnish satisfactory evidence of the cost of the use of such equipment, the cost then shall be determined by

the Project Manager and Design Team as the lesser of (a) the rental rates listed for the equipment in the State Rental Rates, or (b) the rental rates for such equipment prevailing in the locality from local equipment rental agencies.

10.10.4 Individual pieces of tools or equipment not listed in said publication and having a replacement value of $500.00 or less, whether or not consumed by use, shall be considered to be small tools and no payment will be made therefore.

10.10.5 Time for the rental period of equipment already on site shall be based on the time the equipment is in operation on the subject work being performed. Moving time, loading and transporting costs will not be paid for if the equipment is used at the site of the subject work for other than such subject work, unless in the determination of the Project Manager and Design Team, the payment would cover costs that the Contractor would not otherwise have incurred.

10.10.5.1 Time will be billed to the County at the rate most advantageous to the County.

10.10.6 Time for the rental period for equipment not already on the site shall begin at the time the equipment is unloaded at the site, shall include each day that the Contractor reasonably has the equipment at the site, excluding Saturdays, Sundays, and legal holidays unless the equipment is used to perform the subject work on such days, and shall terminate at the earlier of the end of the day on which the work for which the equipment is reasonably required to be present is completed and the end of the day on which the Project Manager and/or Design Team directs the Contractor to discontinue the use of such equipment. When hourly rates are listed in the State Rental Rates, Contractor shall be paid a minimum of four (4) hours. When daily rates are listed in the State Rental Rates, Contractor shall be paid (i) 1/2 day if the equipment is not used, and (ii) one day if the equipment is used.

10.10.7 Contractor shall be entitled to no payment for any cost associated with any temporary or permanent equipment breakdown, including without limitation costs of transportation for repair purposes or costs of repair and replacement parts. Contractor, however, shall be entitled to payment for time of actual use of any equipment substituted for equipment subject to breakdown, and for moving the substitute equipment. In computing the time to be paid for equipment, the Project Manager and/or Design Team shall not count any period of delay caused by equipment breakdown, and to the extent feasible, shall merge into a single period the time of use before breakdown and the time of use thereafter of the repaired equipment or any substitute equipment.

10.11 The value of any work resulting from a change order shall be determined in one or more of the following ways:

10.11.1 By Contractor's estimate with a detailed breakdown showing labor, materials profit and overhead. Such estimates shall be promptly provided upon receipt of a change request and in no case more than ten (10) days after the change is issued.

10.11.2 By unit price stated in the Contract or subsequently agreed upon;

10.11.3 By cost and the percentage allowed by this Contract or by cost and a fixed fee.

10.12 If none of the above methods mentioned in section 10.11 of these General Conditions is agreed upon, the Contractor, provided it received a written order to proceed from the Project Manager, shall proceed with the work. The cost of such work shall then be determined by the County. In such case, the Contractor shall keep and present in such form as the Project Manager and/or Design Team may prescribe, an itemized accounting

together with appropriate supporting data as may be required by the Project Manager or Design Team.

10.13 If the Contractor disagrees as to the amount to be paid for the work performed pursuant to the Change Order, the Contractor shall give to the County written notice of its disagreement, the basis therefore, and all supporting documentation within ten (10) days after delivery to the Contractor of the Project Manager's determination of cost. Such notice of disagreement does not excuse performance by the Contractor of all obligations under the Contract Documents and the Contractor shall proceed with the work. Payments shall be made to the Contractor based on the County's or Design Team's determination of cost. Failure to present such notice of disagreement constitutes a waiver by the Contractor of any entitlement to additional cost above the amount determined by the Project Manager and/or Design Team.

10.14 Force Account. If it is impossible, because of the nature of the work, or for any other reason, to fix an increase in price in advance, the Change Order may fix a maximum price and time extension period, which shall not under any circumstances be exceeded.

10.14.1 Subject to such limitation, such alteration, modification or extra shall be paid for at the actual necessary cost as determined by the sum of the following items 1 to 5, inclusive:

1. Labor, computed at prevailing wage rates, plus related tax(es);

2. Material, including sales taxes and other taxes pertaining to materials;

3. Necessary plant and equipment rental;

4. Overhead and profit computed as indicated under 10.2; and

5. The proportionate cost of premiums on bonds, computed as indicated under section 10.7.5 of these General Provisions, of the total Items 1 to 4, inclusive.

10.14.2 At the end of each day, the Contractor and the Project Manager shall compare records of extra work which is compensated on a force account basis. Said reports shall become the basis of payment for the work performed, but shall not preclude subsequent adjustment based on a later audit by the County.

10.14.2.1 The daily force account work reports shall be on forms satisfactory to the Project Manager and Design Team, and itemize the materials, state the direct cost of labor, state equipment used or on site and its direct cost. Separate daily force account work reports shall be submitted for Contractor and each subcontractor for each separate item of force account work.

10.14.2.2 The daily force account work reports shall show names or identifications, classifications or workers, the hourly rate of pay and hours worked, and the size, type and identification number of equipment, whether the equipment is rented, the time the equipment is on-site and hours the equipment was operated.

10.14.2.3 Material charges shall be substantiated by valid copies of vendor's invoices. Such invoices shall be submitted with the daily force account work reports, or if not available, they shall be submitted with subsequent daily force account work reports or as soon thereafter as may be practicable. Should said vendor's invoices not be submitted within 50 days after the date of delivery of the material or within 15 days after completion of the work under this Agreement, whichever occurs first, the County reserves the right to establish the cost of such materials at the lowest

current wholesale prices at which said materials are available in the quantities concerned delivered to the work on the date of delivery.

10.14.2.4 Rented equipment charges shall be substantiated by valid copies of lessor's invoices. Such invoices shall be submitted with the daily force account work reports, or if not available, they shall be submitted with subsequent daily force account work reports or as soon thereafter as may be practicable Should a leaser's invoice not be submitted within 60 days after the last day of use on the job site of rented equipment which would be covered by such invoices, or within 15 days after completion of the work of the contract, whichever occurs first, the County reserves the right to establish the cost of use of the rented equipment as the lesser of (a) rental rates listed for the equipment in the State Rental Rates, and (b) the rental rates for such equipment prevailing in the locality.

10.14.3 The Contractor's cost records pertaining to work paid for on a force account basis shall be open to inspection and/or audit by representatives of the County during the life of the contract and for a period of three years after the date of acceptance thereof, and the Contractor shall retain such records for that period. Where payment for materials or labor is based on the cost thereof to forces other than the Contractor, the Contractor shall make every reasonable effort to ensure that the cost records of such other forces will be on the same terms and conditions as the cost records of the Contractor. If an audit is to be commenced more than 60 days after the acceptance date of the contract, the Contractor will be given a reasonable notice of time when such audit is to begin

10.15 Contractor shall provide the Project Manager and Design Team with all information requested to substantiate the cost of the change order and to inform the Project Manager and Design Team whether the work will be done by the Contractor or a subcontractor.

10.16 The Contractor shall submit with the proposed change order its request for time extension (if any), and include sufficient information and dates to demonstrate whether and to what extent the change will delay the completion of the Project. In the event of an agreed upon extension of time, the Contractor shall not be subject to any claim for liquidated damages for this period of time, but the Contractor shall have no claim for any compensation for any such delay other than that set forth in the change order itself.

10.17 If the Contractor believes it is entitled to a change order for work it is being required to perform, or is entitled to an extension of time greater than that agreed to by the County, and the County refuses to issue a change order or include the requested extension of time in the change order, Contractor must, at least twenty-four (24) hours prior to commencing the disputed work, inform the County of the reason for the dispute and the amount of the requested change order. No change order will later be approved, or compensation made, for work performed without such prior notice to the County.

10.18 No change or modification by Change Order shall release or exonerate any surety upon any guarantee or bond given in connection with the Contract Documents.

10.19 All Change Orders must comply with the procedures and obtain the approvals required by Title 24 of the California Code of Regulations, section 4-338.

Article 11 DELAYS AND TIME EXTENSIONS.

11.1 The date of completion of Project or designated portion thereof is the date certified by the Design Team when construction is complete and in accordance with the Contract Documents.

11.2 If the Contractor seeks an extension of time, it must present the request to the County within five (5) calendar days of the commencement of the act or occurrence of the event causing the delay that gives rise to the need for extension. The Contractor's failure to provide notice of such a request within the stipulated timeframe constitutes a waiver of such claim.

11.3 Requests for extensions of time must:

11.3.1.1 include a revised schedule, as described in paragraph **8.2.1**, showing the effect of the delaying event; and

11.3.1.2 document all damages incurred or to be incurred by the Contractor as a result of such delay.

11.3.2 In order to document damages, the Contractor and its subcontractors must provide or make available all of its correspondence, bid-related documents, accounting records, superintendent's records, payroll documents, and other pertinent data relating to the Project.

11.4 The Contractor may be granted a time extension if it encounters an Excusable Delay of the work. For purposes of the Agreement and these General Conditions, an “Excusable Delay” is defined as a delay which occurs due to causes completely beyond the control of the Contractor and which it could not have avoided by the exercise of reasonable care, prudence, foresight and diligence.

11.4.1 Excusable Delays: Excusable Delays are any acts of the public enemy, act of God, fire, strike, lockout or commandeering of materials, products, plants, or facilities by the Government, acts of another Contractor in the performance of another contract with the County, action or inaction on the part of the County Building Department, priority of a governmental agency for materials or equipment, flood, violent wind storm, epidemic, quarantine restriction, or freight embargo. The financial inability of the Contractor or any subcontractor and default of any subcontractor, without limitation, shall not be deemed conditions beyond the Contractor’s control and are therefore not Excusable Delays. The Contractor will not be granted time extensions for weather conditions. Excusable Delays shall be grounds for an extension of time, measured in length by the amount of delay to the Project actually suffered by Contractor as a result thereof, but shall not be grounds for any increase in compensation to the Contractor, whether for home, office, general or administrative expenses, field expenses, increased costs of materials or labor, or any other thing.

11.4.2 Compensable Delay: Compensable Delays are, for purposes any delay of the completion of the work beyond the expiration date of the Contract Time caused by the gross negligence or willful acts of the County, Project Manager, or Design Team, and which delay is unreasonable under the circumstances involved, and not within the contemplation of the parties. A Compensable Delay may entitle the Contractor to an extension of the Contract Time and/or increase in the Contract Sum. Except as provided herein, the Contractor shall have no claim for damage or compensation for any delay, interruption, hindrance, or disruption.

11.4.3 Inexcusable Delay: Inexcusable Delays are any delays of the completion of the Project beyond the expiration of the Contract Time resulting from causes other than those listed above. An Inexcusable Delay shall not entitle the Contractor to an extension of the Contract Time or an adjustment of the Contract Sum.

11.5 The Contractor may make a Claim for an extension of the Contract Time, for an Excusable Delay or a Compensable Delay, subject to the following:

11.5.1 If an Excusable Delay and a Compensable Delay occur concurrently, the maximum extension of the Contract Time shall be the number of days from the commencement of the first delay to the cessation of the delay which ends last.

11.5.2 If an Inexcusable Delay occurs concurrently with either an Excusable Delay or a Compensable Delay, the maximum extension of the Contract Time shall be the number of days, if any, by which the Excusable Delay or the Compensable Delay exceeds the Inexcusable Delay.

11.5.3 If an Inexcusable Delay occurs concurrently with both an Excusable Delay and a Compensable Delay, the maximum extension in the Contract Time shall be the number of days determined pursuant to Subparagraph (a) exceeds the number of days of the Inexcusable Delay.

11.5.4 For a Compensable Delay, the Contractor shall only be entitled to an adjustment in the Contract Sum in an amount equal to the actual additional labor costs, material costs, and unavoidable equipment costs incurred by the Contractor as a result of the Compensable Delay, plus the actual additional wages or salary and fringe benefits and payroll taxes of supervisory and administrative personnel necessary and directly employed at the Project site for the supervision of the work during the period of Compensable Delay. Except as provided herein, the Contractor shall have no claim for damage or compensation for any delay, interruption, hindrance, or disruption. There shall be no Compensable Delay unless the event or occurrence giving rise to the Compensable Delay extends the actual completion of the Project past the Contract Time.

11.6 Regardless of the cause of a delay the Contractor may not maintain any claim or cause of action against the County for damages incurred or claimed to be incurred as a result of Contractor's failure or inability to complete its work on the Project in a shorter period than established in this Agreement, the parties stipulating to such period as a reasonable time within which to perform the work on the Project.

11.7 Compliance with this Article is a condition precedent to the County’s duty to pay for damages incurred by the Contractor as a result of delays.

Article 12 DISPUTES.

12.1 If a dispute arises between the County and the Contractor as to an interpretation of any of the specifications or Contract Documents or as to the quality or sufficiency of materials or workmanship, the decision of the County shall for the time being prevail, and the Contractor, without delaying the job, shall proceed with all work to be performed under the Contract as directed by the County without prejudice to a final determination of the dispute.

12.2 All claims against the County must be filed by the Contractor in writing. The Contractor must include all documents necessary to substantiate that claim.

12.3 The Contractor shall not be entitled to the payment of any additional compensation for any act or failure to act on the part of the County or its representatives, including failure or refusal to issue a change order, or for the happening of any event, thing, occurrence, or other cause, unless it shall have given the County due written notice of potential claim, in the manner described in paragraphs 11.2 and 12.4.

12.4 The written notice of potential claim shall set forth the reasons for which the Contractor believes additional compensation will or may be due, the nature of the costs involved, and, insofar as possible, and the amount of the potential claim. The said notice as above required must be given to the County prior to the time that the Contractor performs the

work giving rise to the potential claim for additional compensation, if based on an act or failure to act by the County, and in all other cases, within five (5) days after the happening of the event, thing, occurrence, or other cause, giving rise to the potential claim. Notwithstanding this paragraph, if another provision of these General Conditions specifies that a notice of claim must be given to the County in a shorter period of time, that shorter time period shall prevail.

12.5 In resolving all claims, whatever the amount of the claim, the parties shall proceed pursuant to the terms of California Public Contract Code section 20104, *et seq*.

Article 13 WARRANTY OF SUPPLIES, EQUIPMENT AND RELATED SERVICES.

13.1 In addition to warranties called for elsewhere in these specifications, Contractor shall warranty all work and materials, for a minimum period of at least two (2) years after acceptance and recordation of Notice of Completion, against defective material or faulty workmanship that may arise within that period.

13.2 Additionally, the Contractor agrees to repair or replace, to the satisfaction of the County, any and all such work that may prove defective in workmanship or materials within that period, ordinary wear and tear and unusual abuse or neglect excepted, together with any other work which may be damaged or displaced in so doing. If the Contractor fails to comply with the above-mentioned conditions within five (5) calendar days after being notified in writing, the County may have the defects repaired and made good at the Contractor's expense and the Contractor will pay the costs and charges incurred by the County as a result, including the costs for additional services of the County's Project Manager, Design Teams, engineers, and other representatives, immediately upon demand. Any and all warranties and guarantees offered by manufacturers of equipment used or installed in the Project shall also be extended to the County.

13.3 Notwithstanding inspection and acceptance by the Design Team of all supplies, equipment and related services furnished under the Agreement, the Contractor warrants that:

1. All supplies, equipment and related services under the Agreement will be free from defects in material or workmanship and will comply with the specifications of the Agreement; and

2. All aspects of the shipment of the supplies and equipment related to the Agreement will conform to the specifications of the Agreement.

13.4 Within a reasonable time, the County may either:

1. By written notice, require the prompt correction or replacement of any supplies, equipment or related services that are defective, or that are not shipped in accordance with the specifications of the Agreement, or that otherwise do not conform to the Agreement; or

2. Retain such defective, improperly shipped, or otherwise nonconforming supplies, equipment and related services; whereupon the contract sum shall be reduced by an amount that is equitable under the circumstances and the Contractor shall promptly make appropriate repayment.

13.5 When correction or replacement is required, the County may return such supplies, equipment and related services. Transportation charges and risk of loss or damage for such quantities returned while in transit shall be borne by the Contractor.

13.6 If the Contractor fails to correct or replace the nonconforming supplies, equipment or related services within ten (10) days (or such longer period if so specified by the County in writing) after receipt of notice specifying such failure, the County may, by contract or otherwise, correct or replace them with supplies, equipment and related services of similar quality, at the expense of the Contractor. If the Contractor fails to furnish timely disposition instructions, the County may dispose of the defective, improperly shipped or otherwise nonconforming supplies, equipment and related services in a reasonable manner. In such case, the County is entitled to reimbursement for the costs related to disposition from the Contractor and/or from any proceeds generated by the disposition of such supplies, equipment and related expenses.

13.7 Any replacement supplies, equipment or related services furnished by the Contractor to remedy a defect or nonconformity under the warranty shall also be covered by the terms of the warranty.

13.8 The Contractor shall indicate the total period of the warranty after the supplies, equipment and related services are placed into service. Any defects shall be promptly corrected by the Contractor to the satisfaction of the County and without expense to the County.

13.9 Warranty of Title. The Contractor warrants that title to all work, materials or equipment included in a request for payment shall pass over to the County whether or not they are installed or incorporated in the Project, free from any claims, liens or encumbrances, when such payment is made to the Contractor. It further warrants that no such work, materials or equipment have been purchased for work under the Agreement subject to an agreement by which an interest therein or an encumbrance thereon is retained by the seller or supplier. Notwithstanding this provision, the Contractor retains the responsibility for full replacement of any portion of the Project which is damaged or destroyed prior to the Notice of Completion, as specified elsewhere in this Agreement.

13.10 The rights and remedies included in the warranty are in addition to and do not limit the County's rights under any other clause of the Contract Documents.

Article 14 TRENCHING.

14.1 The Contractor shall take reasonable precautions and make reasonable efforts to detect and protect electrical utilities and appurtenances, including hand digging and use of underground detection instruments and services. Contractor will be required to, at its own cost, promptly and satisfactorily repair damages, which could otherwise have been avoided.

14.2 The Contractor shall comply with Government Code section 4216, *et seq*., relating to subsurface installations and the Regional Notification Center System.

14.3 If the Agreement involves the excavation of any trench five (5) feet or more in depth, the Contractor shall submit in advance of such excavation, for approval of the Project Manager, Design Team, and County, 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 any such trench.

14.4 Contractor shall promptly, and before the following conditions are disturbed, notify the Project Manager and Design Team, in writing, of any:

1. Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the California 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.

2. Subsurface or latent physical conditions at the site differing from those indicated, or

3. 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 Agreement.

14.5 If any condition described in paragraphs 14.3 is discovered, the County shall promptly investigate the conditions, and if it finds that the conditions differ materially from the conditions described in the bid package, or do involve hazardous waste, and cause a material decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the Project, it may issue a change order to the Contractor or contract with another to perform work necessitated by such condition.

14.6 In the event that a dispute arises between the County and the Contractor regarding 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 Project, the Contractor shall not be excused from any scheduled completion date provided for in the Agreement, but shall proceed with all work to be performed under the Agreement. 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 contracting parties.

Article 15 Not Used

Article 16 TOXIC SUBSTANCES CONTROL ACT.

The Design Team, in accordance with 40 CFR, Part 763, EPA Final Rule under Section 203 of Title II of the Toxic Substances Control Act (TSCA), 15, U.S.C. 2641 - 2654, must submit a statement to the County verifying that no asbestos containing building material (ACBM) was specified as a building(s) material, and to the best of its knowledge no ACBM was used as a building material in the building(s). The signed statement shall be submitted prior to Design Team's making recommendation to the Board that the building(s) be accepted.

Article 17 INSPECTIONS.

17.1 The County will provide a representative and Project Inspector (PI) to assist the Design Team in providing competent and adequate inspection during all normal working periods. No work shall be performed except under the inspection of a PI.

17.2 The Project Inspector:

1. shall personally examine items used in the Project for compliance with the Contract Documents and technical instructions from the Design Team;

2. shall report to the Design Team any related work to be installed prior to final approval of shop drawings by the Design Team.

3. shall inspect all materials to determine whether they comply with the Contract Documents and are in a good and acceptable condition;

4. shall monitor materials to determine whether those accepted are the materials that are installed;

5. shall be responsible for monitoring time and material work, by accounting for materials used and logging actual time the Contractor worked on the task;

6. shall supervise on-site testing and ensure that all required tests are performed by a competent testing laboratory; and

7. shall ensure that the Contractor's payment requests accurately reflect progress on the Project and all work completed in compliance with plans and specifications.

17.3 The PI shall recommend to the Design Team to cause the removal and replacement of rejected material and to recommend deduction of the cost thereof from any monies due or to become due the Contractor.

17.4 The PI shall not do any of the following: authorize any deviations from the Contract Documents; advise on, or issue directions relative to, any aspect of the building technique or sequence unless a specific technique or sequence is called for in the Contract Specifications; or approve shop drawings or samples.

17.5 Notwithstanding the foregoing, the Contractor may not rely upon the PI to perform any function for which it would otherwise be responsible. For example, that the PI is expected to attempt to anticipate unacceptable construction practices and to relay such concerns to the Contractor does not remove any responsibility from the Contractor to perform such functions itself.

17.6 When specific inspection is required, the Contractor shall inform the Design Team, County's Representative of the schedule of such work.

17.7 Consistent with requirements of Title 21 and Title 24, Part 1, of the California Code of Regulations, test samples or specimens of material for testing shall be taken by the Design Team, the Project inspector or a representative of the testing agency. In no case shall the Contractor or the Contractor's inspector take the sample. The Design Team shall forward one copy of all test reports to the County. Testing and inspection shall be paid by the County. Retesting and inspection costs shall be reimbursed to the County by the Contractor.

17.8 Uncovering of Work.

17.8.1 If any work is covered contrary to the request of the County representative or Design Team, it shall be uncovered for observation and replaced, at the Contractor's expense.

17.8.2 If any other work has been covered which the Design Team has not specifically requested to observe prior to being covered, the Design Team may request to see such work and it shall be uncovered by the Contractor. If such work was performed in accordance with the Contract Documents, the cost of uncovering the replacement shall, by appropriate change order, be charged to the County. If such work was not performed in accordance with the Contract Documents, the Contractor shall pay such costs.

17.9 Correction of Work.

17.9.1 The Contractor shall promptly correct all work rejected by the County/Design Team as defective or as failing to conform to the Contract Documents whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected work, including the cost for additional services of the County's representatives thereby made necessary.

17.9.2 The Contractor shall bear the cost of making good all work of separate contractors that is destroyed or damaged by removal or correction.

17.10 Final Inspections. The Contractor will be allowed two (2) inspections by the County, the Project Inspector or the County's representatives at the close of the Project to determine completion. The first inspection will be a pre-final inspection. The second inspection, if required, will be the final inspection. All items listed on the pre-final list and any other items required by the Contract Documents and brought to the attention of the Contractor a minimum of five (5) working days before the final inspection shall be completed prior to the final inspection. Any visits to the Project by the County or the County's representative to confirm the completeness of the Project after the final inspection will be charged to the Contractor at the County and the County's representative's normal hourly rates and deducted from the contract sum.

17.11 If work is performed on Saturdays, Sundays, holidays, or after regular work hours during the week, the Contractor shall reimburse the County for all inspection costs incurred during such hours.

Article 18 AUDITING PROCEDURES.

18.1 Upon written notice to Contractor, the County shall have the right to audit all records and documents of any nature whatsoever under the custody or control of the Contractor or Contractor's agents, subcontractors, or representatives, which relate to the Project. Upon the County's request, Contractor shall make these records available to the County, the County's auditors or other representatives appointed by the County.

18.2 The Contractor agrees to comply with the provisions of Sections 1776 and 1812 of the California Labor Code, included, but not limited to the requirement that the Contractor and each subcontractor of every tier shall keep or cause to be kept an accurate record showing the names, addresses, social security numbers, work classifications, activity code for the work provided, straight time and overtime hours worked each day and week of all workmen employed by it in connection with the execution of this Contract or any subcontract thereunder and showing the actual wages paid to each of such workers. These records shall be certified under penalty of perjury as stated in Section 1776 of the California Labor Code and shall be made available for inspection by the Chief of the Division of Labor Standards Enforcement of the State Department of Industrial Law Enforcement of the State Department of Industrial Relations, his deputies and agents.

18.3 Contractor shall ensure that all subcontractors maintain appropriate records relating to the Project. Contractor agrees to furnish records of any subcontractors or other agents of Contractor to the County upon request. If the County requests records relating to a subcontractor or other agent's involvement in the Project, such requests shall be processed through the Contractor. A Contractor's failure to abide by the provisions of the Article shall be deemed a material breach of the contract and, upon the County's election, may be considered a default.

Article 19 MISCELLANEOUS.

19.1 All practices, materials, and workmanship shall conform to all provisions of law applicable to public works projects, including but not limited to: The County of San Mateo Building Regulations and County Ordinances; the California Code of Regulations, Titles 19, 21, and 24; Public Contract Code Sections 4100-14; Government Code Section 4215; Labor Code Sections 1720-35, 1770-81, 1810-15, 1860, and 3700; the National Electric Code; the Uniform Plumbing Code; the Uniform Mechanical Code; and all other applicable laws and regulations, each of which are incorporated into this Agreement by reference. Further, all work and materials shall be in full accordance with the most current rules and regulations of the Fire Marshal and the Division of Industrial Safety. Such laws and regulations shall be considered a part of theses specifications as if set forth herein in full and all work

hereunder shall be executed in accordance therewith. Nothing in these plans or specifications is to be construed to permit work not conforming to all requirements of law. The Contractor shall keep a copy of Titles 19, 21, and 24 of the California Code of Regulations on the job at all times.

19.2 The Contractor may not assign or delegate all or any portion of this Contract without the written consent of the County and no such consent shall be given which would relieve the Contractor or its surety of their responsibilities under the Contract. The Contractor may assign monies due it under the Contract to banks, trust companies or other financial institutions provided written notice thereof is promptly delivered to the County. Assignment of monies earned by the Contractor shall be subject to the same retention as other payments made to it, and shall also be subject to any prior liens for labor, services, materials, equipment or other appliances supplied for the performance of Work under this Contract.

19.3 AS-BUILT DRAWINGS: The Contractor and all Subcontractors shall maintain on the work site a separate complete set of contract drawings which will be used solely for the purpose of recording changes made in any portion of the work during the course of construction, regardless of the reason for the change. As changes occur, there will be included or marked on this record set on a daily basis if necessary to keep them up to date at all times. Actual locations to scale shall be identified on the drawings for all runs of mechanical and electrical work, including all site utilities installed underground, in walls, floors, and furred spaces, or otherwise concealed. Deviations from the drawings shall be shown in detail. All main runs, whether piping, conduit, duct work, drain lines, etc., shall be located in addition by dimension and elevation. Progress payments may be delayed or withheld until such time as the record set is brought up to date to the satisfaction of the Design Team. The Contractor shall verify that all changes in the work are included in the "AS-BUILT" drawings and deliver the complete set thereof to the Design Team for review and approval within thirty (15) calendar days after County’s substantial completion. County’s acceptance and approval of the "AS-BUILT" drawings are a necessary condition precedent to the release of the final retention.

END OF SECTION

00630
GUARANTEE FORM

County of San Mateo Department of Public Works

Realize Flood Park Project – Phase One

We hereby guarantee that the _____work performed for the County of San Mateo ("County") for Realize Flood Park Project has been performed in accordance with the Drawings and Specifications and that the work, as installed, will fulfill the requirements of the Guarantee included in the Specifications. We agree to repair or replace all of our work, together with adjacent work which may be displaced by so doing, that may be proven to be defective in its workmanship or materials within a period of Two (2) year(s) from date of recordation of Notice of Completion for the above-named project by the County, without any expense whatsoever to the said County, ordinary wear and tear and unusual abuse or neglect excepted.

Further, we agree that the guarantee period for corrected defective work shall continue for a duration equivalent to the original guarantee period.

In the event of our failure to comply with the above-mentioned conditions within seven (7) days after being notified in writing by the County, we collectively or separately do hereby authorize the County to proceed to have said defects repaired and made good at our expense and we will honor and pay the costs and charges therefrom upon demand.

Date: _____ Signed: _____
(Subcontractor) (Supplier)

Date: _____ Signed: _____
(Contractor)

Date: _____ Signed: _____
(Trade Contractor Countersignature if applicable)

Local Representative to be contacted for services:

Name: _____ Phone No. _____

Address: _____

00700
SCOPE OF WORK

Following is a general summary of the scope of work. It is in no way to limit the scope of work as indicated in the Plans and Specifications.

1. All work as indicated on the plans and specifications.
2. All off-haul of spoils and debris and lawful disposal.
3. Site Grading must be performed by a pre-qualified Contractor.
4. All work necessary for a complete and functional system, as designed.
5. All site furnishings, signage, and installations.
6. All temporary facilities, erosion control, Wildlife Exclusionary Fencing, and equipment to accommodate work and workers.
7. Monitoring and maintenance of erosion control measures and Wildlife Exclusionary Fencing.
8. All dewatering, tarping, tilling, etc. as necessary to accommodate project schedule at no additional costs.
9. Project Closeout documents.

00800
SPECIAL PROVISIONS

1.1 CONSTRUCTION MILESTONE SCHEDULE

The time for completion of all Work is within **187 working days** of the date of the Notice to Proceed, which shall be in accordance with the General Conditions as indicated in section 00700 - Scope of Work. To implement this project on schedule, the Contractor is responsible for providing all necessary dewatering, water diversion, tarping, and protection from inclement weather. The milestones' completion time is as set forth in the below Construction Milestone Schedule. The exact terms and restrictions govern any extensions of time for completion of milestones as applicable to extensions of the Contract Time referenced in the General Conditions.

Schedule of Work to accommodate the following milestone requirements:

Bid Date	January 18, 2024
BOS Approval of Construction Agreement	February 13, 2024
Anticipated Notice to Proceed (NTP) #1	February 14, 2024
Begin submittals and procurement	February 15, 2024
Project Kickoff Meeting (no later than)	February 28, 2024
Mobilization and Start of Construction (no later than)	February 29, 2024
Phase 1.1 – Work Suitable for "winter conditions"	
Perimeter Fencing and signage are complete	March 04, 2024
SWPP/BMP are Complete	March 11, 2024
Complete Bay Rd. Construction Entrance	March 15, 2024
Tree Protection installation is complete	April 12, 2024
Tree Removal operations are complete	April 15, 2024
Drop-In Picnic Area Removal is complete	May 09, 2024
Site Demolition (removal of exposed elements not impacted by potential rain)	May 24, 2024
Phase 1.2 – Work not Suitable for "winter conditions"	
Anticipated Notice to Proceed #2	April 15, 2024
Complete Installation of Sedimentary Concrete Grill Counters	August 15, 2024
Complete Site Paving	August 30, 2024
Complete Athletic Facilities	September 15, 2024
Complete installation of all landscaping and plants	October 15, 2024
Final Inspections Complete	October 15, 2024
All project scopes are complete	October 30, 2024 (Target date; SMCP understands PG&E drives this)
Contract Completion Date	November 1, 2024
End of 90-Day Landscape Maintenance Period	January 13, 2025
Record "Notice of Completion"	January 17, 2025

1.2 MAINTENANCE TRAINING

Contractor to provide on-site maintenance training for County personnel. Time and date of the training will be coordinated prior to completion of the project.

SECTION 01 11 00

SUMMARY OF THE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The following subjects are included in this section:
   1. Project Description
   2. Project Phasing
   3. Superintendent / Supervisory Staff
   4. Special Project Requirements
   5. Protection of Work
   6. Owner Furnished / Contractor Installed
   7. Permits, Licenses, & Fees
   8. Partnering

1.3 PROJECT DESCRIPTION

A. Work Included in the Contract: The work to be done consists of, in general, the construction of a small multi-use sports field, tennis/pickleball courts, a basketball court, sand volleyball courts, reservable and drop-in picnic areas, walking paths, utility infrastructure, improvements to the northern parking lot, landscape improvements, tree planting, other items and details not mentioned above but required by the Project Plans, Specifications and these Special Provisions, and the directions of the County appointed Construction Manager. The Work included shall consist of all construction and services involving work related to:

   1. Site Preparation and security
   2. Site Utilities including trenching and backfill
   3. Site Improvements
   4. Site Cleanup

B. Contract Time: **187 working days.**

C. Liquidated Damages: **$1,000 per calendar day.**

1.4 PROJECT PHASING

A. Phasing Plan/Sequence of Work: In addition to the baseline project schedule the Contractor shall prepare a construction sequencing plan indicating the stages and areas of construction. The plan shall indicate the areas and dates associated with each stage of work. The plan will include areas that will remain open to the public during construction as directed by the Owner. The plan will also include construction access points and materials staging areas. Refer to Section 015639 “Tree Removal and

Landscape Protection" for specific requirements related to tree protection and the Tree Protection Plan preparation.

The baseline project schedule and construction sequencing plan shall include provisions for coordination and integration of the Pump Track Design-Build scope and the CMAS procurement of the Synthetic Turf..

A. Owner Occupancy: Work will occur while portions of Flood Park remain in use by San Mateo County Parks and park visitors

B. Maintenance Periods – The Contract will not be complete until the conclusion of all maintenance periods.

1. Work Under Separate Contract (Also refer to Contract Agreement Article 11

2. The Owner reserves the right to award separate contracts for the performance of work within or adjacent to the project site. Work may be conducted simultaneously with work under this contract.

The contractor shall cooperate fully with separate contractors and coordinate work so that work under separate contract may be carried out efficiently, without interfering or delaying Contractor's work.

3. Disagreements between the Contractor and entities performing work under separate contract concerning concurrent use of work areas and access to site which are not resolved by the participants shall be referred to the Owner Representative. Contractor agrees to abide by the Owner Representative's determination as to concurrent use or priority of access, and to perform work in compliance with the Owner Representative's resolution at no additional cost.

4. Relationship to Work Under the Contract: Work under the Contract shall include all provisions necessary to make such concurrent work under separate contracts complete in every respect and fully functional, including field finishing. Provide necessary backing, supports, piping, conduit, conductors and other such provisions from point of service to point of connection, as shown on Drawings and specified herein. See Section 01 31 13 - Coordination for additional requirements.

5. Documents for Work Under Separate Contracts: Owner's Representative will make available, in a timely manner, drawings and specifications of work under separate contracts for coordination and further description of that work.

a. If available, such information will include drawings, specifications, product data, lists and construction schedules for such work.

b. Information concerning work under separate contracts or directly by Owner will be provided for convenience only and shall not to be considered Contract Documents.

5. Permits, Notices and Fees for Work under Separate Contracts: Notices required by and approvals required of, authorities having jurisdiction over work under separate contracts and related fees, will be solely the responsibility of Owner.

1.6 SUPERINTENDENT / SUPERVISORY STAFF

A. The following requirements are in addition to the requirements of the Contract General Conditions:

1. The Contractor shall employ a competent Superintendent able to read, write and communicate fluently in English. The Superintendent shall be on site at all times during which work occurs on the project site and shall be fully authorized to represent Contractor in all matters pertaining to the work of this contract. All communications and agreements with the Superintendent shall be binding upon Contractor. The Superintendent shall be acceptable to the Owner and shall continue in the capacity of Superintendent for the duration of the project unless the Superintendent ceases employment with Contractor or the Owner otherwise agrees. The Superintendent shall not be employed on any other project by the Contractor during the course of this project.

2. Work shall not occur on the site except under the direct supervision of the Superintendent. Failure to maintain a Superintendent on the Project site at all times that work is occurring will result in the issuance of a stop work notice by the Owner Representative. Any schedule impact resulting from said stop work order shall be the responsibility of the Contractor; no additional costs for delay will be due Contractor, nor will assessment of liquidated damages be suspended to account for the work stoppage.

3. In addition to the Superintendent, Contractor shall assign a full time project manager solely dedicated to the work of this project for the duration of the project.

1.7 SPECIAL PROJECT REQUIREMENTS

A. Cooperate and coordinate with the County Construction Management team and the CMAS Vendor to complete the Synthetic Turf installation for the small multi-use field and volleyball seating area.
   a. The general contractor shall provide the following site preparation, grading, and drainage systems in advance of the synthetic turf installation:
      i. Clearing and grubbing of the field area.
      ii. Installation of the perimeter drainage trench and pipe.
      iii. Installation of utilities.
      iv. Installation of irrigation system including rotors within field turf based on coordination with the synthetic turf vendor.
      v. Rough and fine grading of field subgrades
      vi. Installation of the concrete curb perimeter curb (P10).
      vii. Topsoil placement and transition grading from concrete curb to adjacent grade according to grading plans.
      viii. H. Installation of volleyball court edging and aggregate base.
   b. The CMAS Vendor will provide and install;
      i. 3” Drainage course per details.
      ii. 6” Class II permeable base per details.
      iii. Shockpad
      iv. FieldTurf Synthetic Turf
      v. Organic cork/sand infill
      vi. HDPE Header per details
      vii. All markings and seams

B. Coordinate with the County Construction Management team and the Pump Track Design-Build Contractor to complete work adjacent the pump track.
   a. Provide the following scopes of work in association with the Pump Track;

i. Wood Fencing
ii. Type P1 Paving at Entry Area
iii. Benches
iv. Trash Cans
v. Irrigations Systems
vi. Planting/Mulching
vii. Tree Protection for the above.

C. Coordinate with the County Construction Management team and the Specialty Vendor to complete the Sedimentary Concrete structures at the reservable picnic areas.

D. Ensure the timely completion of special work based on the approved construction schedule. Develop the schedule to conform with the Project Milestone dates provided in Section 00 80 00 – Special Provisions; 1.1 – Construction Milestone Schedule

1.8 PROTECTION OF WORK

A. Protect the Work from theft, vandalism, and unauthorized entry. The Contractor is exclusively responsible for job site security.

B. During Off-Work Hours. During all hours that Work is not being prosecuted, furnish such watchman's services as Contractor may consider necessary to safeguard materials and equipment in storage on the Project site, including Work in place and in process of fabrication, against theft, acts of malicious mischief, vandalism, and other losses or damages.

1.9 OWNER-FURNISHED/CONTRACTOR-INSTALLED PRODUCTS

A. Owner-Furnished/Contractor-Installed (OFCI) Products: Owner will furnish, for installation by Contractor, products which are identified on the Drawings and in the Specifications as "OFCI (Owner-Furnished/Contractor-Installed)", "installed by General Contractor," or similar terminology. See Drawings for identification of such products.

B. Relationship to Work under the Contract: Work under the Contract shall include all provisions necessary to fully incorporate such products into the Work, including, as necessary, fasteners, backing, supports, piping, conduit, conductors and other such provisions from point of service to point of connection, and field finishing, as shown on Drawings and specified herein.

1.10 PERMITS, LICENSES AND FEES

A. Permits, Licenses and Fees, General: Refer to Contract Agreement, Article 24.

B. Licenses: Contractor shall obtain and pay all licenses associated with construction activities, such as business licenses, contractors' licenses and vehicle and equipment licenses. All costs for licenses shall be included in the Contract Amount.

C. Parking Fees: Contractor shall obtain and pay for all parking permits and fees for vehicles parked off of the Construction Site. Refer to Section 01 55 00, Vehicular and Pedestrian Controls for additional parking requirements.

1.11 PARTNERING

A. The Owner intends to encourage the foundation of a cohesive partnership with the Contractor and its Subcontractors, the Architect and its consultants, and the Owner. This partnership will be structured to draw on the strengths of each organization to identify and achieve reciprocal goals. The objectives are effective and efficient Contractor performance, intended to achieve completion within budget, on schedule, and in accordance with the Contract Drawings and Specifications.

END OF SECTION

SECTION 01 14 00

WORK RESTRICTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The following subjects are included in this section.

1. Submittals
2. Work Plans
3. Contractor's use of Premises
4. Contractor's Use of Project Area
5. Time Restrictions
6. Noise and Vibration Restrictions
7. Owner's use of Site and Premises

1.3 SUBMITTALS

A. Submit each Work Plan for review and approval a minimum of (21) calendar days prior to the start of construction in areas affecting Owner operations. Participate in review of proposed Work Plan with the Construction Manager, Architect and Owner. Within 3 calendar days after joint review, submit revised Work Plan.

B. Format/Submittal Requirements

1. Contractor's Work Plans shall be in the form of marked-up drawings, sketches and/or original drawings that clearly convey the nature and location of Contractor's planned activities. Drawings shall be supplemented by written descriptions of the work. Work Plans shall be submitted in written narrative form where without drawings they adequately describe construction activities, impacts and protectionary measures.
2. Work Plans shall be submitted in accordance with the requirements of Section 01 33 00.

1.4 WORK PLANS

A. Submit comprehensive written work plans for all activities affecting Owner operations, including but not limited to, the following:

1. Barricade and Fencing locations.
2. Haul routes.
3. Routing vehicular and pedestrian traffic around specific construction areas.
4. Utility shutdowns/tie-in to existing utilities.
5. Disabled access routes.
6. Emergency Vehicle access.

7. Contractor offices and laydown
8. Construction site and contractor parking access.
9. Large equipment access (cranes, loaders, backhoes, etc.)
10. Work within pedestrian thoroughfares and Park roads.
11. Work within the inner-Park area.
12. Crossing the SFPUC ROW Corridor

B. Use work plans to communicate Project impacts to the Park community.

C. Contractor shall cooperate with the Owner to minimize conflicts and facilitate Owner operations.

1. Off-hours and weekend work may be required for existing utility shutdowns and other work of major impact to the Owner. No additional costs shall be paid by the Owner due to this requirement.

1.5 CONTRACTOR USE OF PREMISES / WORK RESTRICTIONS

A. General

1. Conduct the work so as to impose no hardship on the Owner or others engaged in the Owner' work nor cause any unreasonable delay or hindrance thereto.

2. Construction activities will be scheduled to minimize disruption to the Owner and to Park users.

3. The Contractor may not interrupt any Park utilities without prior written permission from the Owner. Requests for utility shutdowns shall be submitted a minimum of 7 calendar days in advance of the requested shutdown date.

4. The Work of the Project is to be completed within an operating Park, and that
Owner operations and construction activities by others will be in progress at the Work Site during the course of this Contract. Refer to Section 01 14 00 – Work Restrictions for additional requirements.

B. Surrounding Site Condition Survey

1. Prior to commencing the work, the Contractor and the Owner Representative shall tour the Project Site together to examine and record damage to existing buildings, landscape, hardscape and other improvements, both on and adjacent to the project site. The resulting record shall serve as a basis for determination of subsequent damage due to Contractor's operations and shall be signed by parties involved in the. Any damage to existing improvements not noted in the original survey, but subsequently discovered, shall be reported to the Owner Representative immediately.

C. Protection of Existing Structures and Utilities (also refer to Contract General Conditions)

1. Locate all known existing utility installations before proceeding with construction operations which may cause damage to such installations. The existing utilities shall be protected and maintained in continual service at the Contractor's expense. Where existing utilities cross or are adjacent to the work of this contract, the Contractor shall notify the Owner Representative a

minimum of 48 hours in advance of commencement of work and receive approval for the method of uncovering the utility. The Contractor shall locate the existing utility(s) by hand digging, pot holing, locator device, ground penetrating radar, X-ray, or other methods recommended by the Contractor and approved by the Construction Administrator. Repair of damage to existing utility(s) shall be at the Contractor's expense.

2. In the event that undocumented existing structures or utilities are encountered, the contractor shall immediately notify the Owner Representative and request direction concerning how to proceed with the work.

3. Should the Contractor damage any existing structure or utility, the Contractor shall take immediate action to ensure the safety of both persons and property.

4. Contractor shall visit existing building(s) and grounds and thoroughly familiarize itself with existing conditions. Existing record drawings are available for Contractor review at [*state location*]

5. Contractor shall include all necessary pipe offsets, fittings, etc. as required to complete the work in the base bid. No additional costs due to the Contractor's failure to survey existing conditions and review available record drawings will be allowed.

6. Contractor shall note all utility items (utility meters, junction boxes, valve boxes, post indicator valves, man-hole covers, etc.) at or above grade in the vicinity of the project site prior to commencing with trenching operations. These items indicate the presence of underground utilities in the area which shall be located and kept in continual service. This requirement shall apply regardless of inclusion of these utilities on existing record documents.

7. When cutting, removal or alteration of existing work is required to form connections with new work or otherwise to meet the requirements of the contract documents, perform such work so as not to damage the work that will remain in place. Refer to sections for cutting, patching and repair requirements.

8. Contractor shall provide all necessary materials, equipment and labor to adequately protect existing structures, floors, architectural finishes, utilities, landscape and hardscape which may be impacted by the work of this contract.

D. Allowable Work Schedule

1. Normal construction activities shall be performed Monday through Friday between the hours of 8:00 am and 5:00 pm, excluding holidays.
2. Shutdown of existing utilities or other activities which impact Park operations shall be scheduled in advance with the Owner Representative in accordance with paragraph 1.5-A-3 above, and shall be scheduled during off-hours at the discretion of the Owner and at no additional cost to the Owner.
3. 72 hours prior to any anticipated night, weekend, or holiday work, request permission in writing from The Owner to modify the work schedule.

E. Site Decorum

1. Control the conduct of labor forces and prevent unwanted interaction initiated by workers with the Owner staff, park guests or other individuals other than those associated with the project.

2. In the event that any worker initiates unwanted interaction, utilizes profanity, or (in the opinion of the Owner Representative) conducts him/herself in an offensive or unprofessional manner, the Contractor shall immediately remove the worker from the project and replace said worker with another of equivalent technical skill at no additional cost to the Owner.
3. No smoking is allowed on the Project Site.
4. No radios, other than 2-way communication type, shall be allowed on the project site.
5. Provide an ANSI Class II - Heavy Duty Safety Vest service and Hard Hat for every employee, every subcontractor, every sub-tier subcontractor, and subcontractor employee working on-site, if they do not have one. **ANSI Class II high visibility clothing is not optional. Failure to comply with this requirement will result in a $1,000.00 credit to the Owner via credit change order. Contractor shall maintain a supply of at least 10 vests on site at all times.**

F. Owner Keys

1. Contractor shall provide a written request to the Owner for keys to existing facilities. If the Contractor fails to return a key, a lost key fine shall be charged for the cost of re-keying Park locks

2. Site fences shall be locked with the Owner standard lock in order to allow the Owner 24 hour access for maintenance and inspection, or response to an emergency condition. Should Contractor wish to use a different lock, it shall be double-locked with the Owner standard lock at all times that the site is secured.

1.3 CONTRACTOR'S USE OF PROJECT AREA

A. Location of Work: The Work shall be accomplished within areas indicated on Drawings as Project Area or, if not indicated, to areas as directed by Owner's Representative. Use of other areas, including parking areas, shall be subject to approval by Owner's Representative. Refer to Section 01 55 29 - Construction Staging Areas and Section 01 55 00 - Vehicular and Pedestrian Controls for additional requirements.

1. Contractor shall not unreasonably encumber the site with materials or equipment.
2. Contractor shall assume full responsibility for protection and safekeeping of products stored on the premises.
3. Contractor shall move any stored products which interfere with operations of Owner or contractors performing work under separate contracts for Owner.
4. Temporary closures or restrictions of use of public thoroughfares, necessary to accomplish the Work, shall be made only as approved in advance by public safety and parking authorities having jurisdiction, as directed in writing by the Owner's Representative.
5. Refer to Civil, Landscaping, Electrical, and Plumbing drawings for trenching work limitations.
6. Once the Contractor begins Work on a trenching heading, the Work shall proceed on a minimum 8 hours per day continuous basis, as weather permits, without stopping until the open trenches are backfilled and the surfaces are re-established.

B. Unless otherwise specified or indicated on the Drawings, during the construction period the Contractor shall have full use of the designated Project Area for construction operations, including use of the site. Contractor's use of Project Area shall be limited only by Owner's right to perform

construction operations with its own forces or to employ separate contractors on portions of the Project in accordance with the Contract General Conditions.

C. Continued Use of Existing Buildings and facilities: Maintain existing buildings in a weather tight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during the construction period. Regions of the park excluded from the Construction Area in the drawings will remain open and operational throughout the construction phase.

D. Cooperation with Others:

1. The Contractor shall at all times cooperate with, coordinate the Work with and provide access to the Owner, Owner Contractors, and buildings operating in the vicinity of the Project Site to the extent necessary for the Work and ongoing operations at the Owner may progress in an orderly manner. The Contractor shall implement measures to minimize disruption to ensure the Contractor's actions and methods of operation will not result in interference with ongoing operations at the Owner. The Contractor shall have no claim against the Owner as a result of these other activities. If Contractor's Work causes disruption to ongoing Park operations, Contractor shall work irregular hours and/or implement other measures, at the Contractor's expense, to avoid any disruption to ongoing Owner operations.
2. The Contractor agrees and acknowledges that the Work of the Project is to be completed within an operating Owner, and that Owner operations and construction activities by others will be in progress at the Work Site during the course of this Contract.
3. The Contractor shall coordinate construction activities with the Construction Manager to minimize interference with all parties concerned.

E. Protection of Existing Improvements and Facilities: Contractor shall protect property adjacent to the Project Area and all existing improvements and facilities within the Project Area, including paving and landscaping indicated to remain.

1. All existing improvements and facilities, except those specifically indicated for removal or reconstruction shall be protected with temporary barriers, enclosures and passageways.
2. After completion of Work, existing improvements and facilities shall be restored to original condition and location. Project Area shall be cleaned and restored to presentable condition, equivalent to or better than the condition prior to start of Work.
3. Should existing improvements and facilities be damaged or soiled beyond renovation or repair, new products shall be provided by Contractor equivalent to existing products, as directed by Owner's Representative.

F. Project Area Access: Limit access to site to indicated routes and access points as identified. If routes and access points are not indicated, access shall be as approved and as directed by Owner's Representative. Do not restrict access to adjacent facilities and do not restrict access for those performing work under separate contracts for Owner.

1. Access to and egress from Project Area shall be in strict conformance to prearranged routes approved by Owner's Representative, with the understanding that curtailment of construction traffic or revision of access routes may be required on short notice if Owner's operations mandate such changes because of excessive noise or problems of safety, service or supply.
2. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to service and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    a. Schedule deliveries to minimize use of driveways and entrances, space used, and the amount of time that materials are stored on-site.

G. Emergency Access: Provide pathways, drives, gates, directional signage and other provisions as required by authorities having jurisdiction for emergency access to Project Area and adjoining Park facilities.

H. Emergency Egress: Maintain all pathways, drives, gates, and other means of egress during construction as required by public safety authorities having jurisdiction.

1.4 TIME RESTRICTIONS

A. Contractor's Work Hours: Work shall be limited to Monday through Friday, except Owner observed holidays, during hours of 8:00am to 5:00pm.

1. Work on other days and at other hours shall be only with written approval of Owner's Representative.
2. If it becomes necessary to perform Work on weekends and holidays, in order to meet milestone and final completion dates, Work shall be performed at no change in Contract Amount unless authorized by written Change Order or Field Instruction by the Construction Administrator.

1.5 NOISE RESTRICTIONS

A. Noise Restrictions: Minimize noise from construction activities. Limit loud construction (>85dB) activities before 9:00 AM.

1.6 OWNER'S USE OF SITE AND PREMISES

A. Owner's Use of Site and Premises: Owner reserves the right to occupy and to place and install equipment in completed or partially completed areas of buildings and site. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. Full Owner Occupancy: Owner will occupy site and existing buildings during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations.
2. Partial Owner Occupancy: Owner reserves the right to occupy and to place and install equipment in completed areas of the Park provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
3. Before Owner occupancy, all systems shall be fully operational, and required tests and inspections shall be successfully completed. Unless otherwise agreed in writing by the Owner, warrantee periods shall not begin until date established by Notice of Completion filed at Contract closeout.
4. Upon occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of the Park.

PART 2 - PRODUCTS

Not Applicable to this Section

PART 3 - EXECUTION

Not Applicable to this Section

END OF SECTION

SECTION 01 23 00

ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes: Administrative and procedural requirements for Alternates.

1. Acceptance or rejection of each Alternate is at discretion of the Owner. None, any, or all Alternates may be accepted or rejected by the Owner in order of precedence.

B. Requirements and descriptions for products and scopes of Work identified as Alternates in the Drawings and Specifications and listed as “Bid Alternative “on the Bid Proposal Form.

C. Included in this Section: non-technical descriptions of Alternates listed by number only on the Bid Proposal.

D. Included in other Sections: technical specifications for work revising or adding/deducting from Base Bid work by Alternates.

E. Unless otherwise specifically provided, the work described in Alternates shall be completed with no increase in Contract Time.

F. The additional cost or credit for each Alternate shall represent the total adjustment to the contract sum associated with said Alternate.

G. Refer to the Bid Proposal Form for information concerning order of acceptance of alternates.

H. All labor, material, equipment, accessories, and incidental items required for a complete installation shall be included, whether or not specifically mentioned as part of the Alternate. Contractor shall perform necessary modifications or adjustments to affected adjacent work, whether new or existing, in order to fully and properly integrate the Alternate work into the Project. These necessary modifications and adjustments shall be included in the Alternate

1.3 QUALITY ASSURANCE

A. The Base Bid specifications shall govern work of Alternates unless otherwise noted.

1.4 GENERAL REQUIREMENTS FOR ALTERNATES

A. Coordination:

1. Determine the full effect on the Work of implementing each Alternate, including coordination, modification or adjustment of portions of the Work. Contract Amount included on the Bid Form for each Alternate includes the cost for all work required to incorporate the Alternate.

2. To enable Owner to compare total costs where alternative materials and methods might be used or where scope of Work might be altered, Bid Alternate Work items have been established as described in this Section.

3. Unless otherwise noted, Alternates will be accepted in the order listed until the Construction Budget is reached.

A. Contract Amount included in Base Bid and as stated in executed Agreement shall include all costs for Work described in Contract Documents.

A. Bid Proposal Form or other means prescribed for submission of proposed cost of Work shall include line items for each Alternate described in this Section. No Alternates other than as described in this Section shall be submitted, except in accordance with product options and substitutions provisions specified in Section 01 25 00, Substitution Procedures.

B. Each Alternative is identified herein by number. This identification shall be used whenever referring to Work described in Alternate and when submitting cost proposals and payment requests.

C. Alternative construction described in Alternates and revised scopes of Work shall be performed only when such Alternate is made a part of the Work by specific provision in the Owner-Contractor Agreement, if selected by Owner prior to execution of the Agreement, or by Change Order or Change Directive if selected subsequent to execution of the Agreement.

D. Costs for Alternates shall be valid for no less than *120* calendar days from date of Notice to Proceed and Owner may select any or all Alternates during that time. Once an Alternate is selected and the Contract modified for Work as described in the Alternate, changes to return to original scope of Work will be made only by Change Order or Change Directive in accordance with provisions of the

PART 2 - PRODUCTS AND EXECUTION

2.1

A. If Owner elects to proceed on the basis of one or more of the described Alternates, Contractor shall make all modifications to Work as required to provide products complete, in place and fully functional, including all labor, equipment, services and incidental consumables necessary to apply, install and finish Work described in Alternate in accordance with requirements specified in related product Sections of these Specifications.

B. Cost for Alternates shall be complete and include all net increases and decreases in Contract Amount for Work described in Alternate and for all changes in related Work. No claims for additional costs to Owner will be honored other than as stated in cost proposal for each Alternate.

2.2 SCHEDULE OF ALTERNATES

A.Deductive Alternate Bid No. 1 – Water Connection at Bay Rd.

1. Base Bid condition: The Base Bid is a water connection at Iris Ln Alternate Bid condition: Water connection for Potable Water and Fire Suppression at Bay Rd, as shown on Sheets ____
2. Location in contract documents Base Bid - ; Alternate -

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. General requirements applicable to substitutions of materials, products, equipment and systems.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by Contractor after award of Contract are considered to be requests for substitutions. Following are not considered to be requests for substitutions:

1. Substitutions requested during bidding period, and accepted by Addendum prior to award of Contract, are included in Contract Documents and are not subject to requirements specified in this Section for Substitutions.
2. Revisions to Contract Documents requested by Owner Representative or Architect.
3. Specified options of products and construction methods included in Contract Documents.
4. Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBSTITUTION OF MATERIALS AND EQUIPMENT

A. Substitutions, General: Catalog numbers and specific brands or trade names are used in materials, products, equipment, and systems required by the Specifications to establish the standards of quality, utility and appearance required. Alternative products which are of equal quality and of required characteristics for the purpose intended may be proposed for use provided the Contractor complies with provisions of Supplementary General Conditions and Contract General Conditions, subject to the following provisions.

1. See Section 01 60 00 - Product Requirements for requirements regarding product options.
2. Substitutions will only be authorized by properly executed Change Order.
3. Product and Material Substitution period ends 10 days prior to bid. The Owner has no obligation to entertain substitutions**.**

1.5 SUBMITTALS

A. Requests for substitutions will not be considered before selection of Contractor. Substitutions will not be considered when:

1. Indicated on shop drawings or product data submittals without separate formal "Substitution Request by the Contractor.
2. Requested directly by subcontractor or supplier.
3. Acceptance will require revision of Contract Documents.
4. Proposed changes are not in compliance with general intent of Contract Documents.

A. Requests for substitutions will be considered only as allowed in the Supplementary General Conditions and Contract General Conditions. Other requests will be considered after Notice to Proceed only when:

1. Specified product or method of construction cannot be provided within Contract Time. Architect or Owner Representative will not consider request if product or method cannot be provided as result of failure to pursue Work promptly or coordinate activities properly.
2. Subsequent information or changes indicate specified product will not perform as intended.
3. Requested substitution offers Owner substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities include compensation to Architect for redesign and evaluation services, compensation to Owner Representative for additional processing and evaluation services, increased cost of other construction by Owner, and similar considerations.
   a. Owner Representative and Architect's time shall be compensated as specified for compensation of time in paragraph 01 25 00-H-3-a.
4. Specified product or method of construction cannot receive necessary approval by governing authority, and requested substitution can be approved.
5. Specified product or method of construction cannot be provided in manner that is compatible with other materials and where Contractor certifies that substitution will overcome incompatibility.
6. Specified product or method of construction cannot be coordinated with other materials and where Contractor certifies that proposed substitution can be coordinated.
7. Specified product or method of construction cannot provide warranty required by Contract Documents and where Contractor certifies that proposed substitution provides required warranty.

C. Do not order or install substitute products without written acceptance from the Owner.

D. Only 1 request for substitution for each product will be considered. When substitution is not accepted, provide specified product.

E. Architect will determine acceptability of substitutions.

F. Submit substitution requests as a typical submittal. Name the Submittal "ITEM BEING SUBSTITUTED"_SUBSTITUTION REQUEST

1. Identify products by Specification Section and Article numbers.
2. Provide manufacturer's name and address, trade name of products, and model or catalog number.
3. List fabricators and suppliers as appropriate.
4. Document each request with complete data substantiating compliance of proposed substitution with requirements of Contract Documents including independent laboratory testing reports, approval

numbers, listings, and approved assembly descriptions as requested by Park Construction Manager or Architect, or as required by agencies having jurisdiction.

5. Attach product data as specified in Section 01 33 00.

6. Give itemized comparison of proposed substitution with specified product, listing variation, and reference to Specification Section and Article numbers.
7. Give quality and performance comparison between proposed substitution and specified product.
8. Submit written certification from manufacturer that proposed substitution is appropriate for this application.
9. List availability of maintenance services and replacement materials.
10. State effect of substitution on construction schedule, and changes required in other Work or products.

G. By making requests for substitutions, Contractor:

1. Represents that Contractor has personally investigated proposed substitute product and determined that it is equal to or superior in all respects to that specified.
2. Represents that Contractor will provide same warranty for substitution that Contractor would for the specified product.
3. Will coordinate installation of accepted substitute, making such changes as may be required for Work to be compatible with substrates and adjacent materials, and complete in all respects.
4. Waives claims for additional time related to substitution that may later become apparent.
5. Certifies that cost data presented is complete and includes related costs under this Contract, including redesign costs, and waives claims for additional costs related to substitution which may later become apparent.

H. Modification of Documents: Where substitution requires changes to design of Work as indicated on accepted Shop Drawings for proper installation; furnish drawings and specifications prepared by and bearing seal of licensed Architect and Architects as appropriate, revising Shop Drawings.

1. Submit revised Documents for acceptance in accordance with Section 01 33 00.
2. Revised Drawings shall be sufficiently complete for proper installation of substitution and related Work.
    a. Include details of connection to and relationship with adjacent materials.
3. If, in Architect’s sole judgment, proposed substitution is of such significance or deals with product or system affecting basic design or aesthetics, pay Architect for changes required to Contract Documents as follows:
    a. Reimburse Owner for Architect's account for time spent in changing Contract Documents at rate of 3.2 times rate of Direct Personnel Expense (DPE). Direct Personnel Expense is defined as direct salaries of Architect's personnel engaged on Project and portion of costs of mandatory, and customary contributions and benefits related thereto, including employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, pensions, and similar contributions and benefits.
4. Contractor is responsible for cost of revised Documents, obtaining and paying for review and plan check by authorities having jurisdiction, and cost of revised construction.
5. Submit revised drawings with Record Documents in accordance with Section 01 78 39.

1.6 SUBMITTAL PROCEDURES

A. Architect's and Owner Representative's Action: If necessary, Architect through Owner Representative will request additional information or documentation for evaluation within 1 week of receipt of request for substitution. Architect will notify Contractor of acceptance or rejection of substitution within 2 weeks of receipt of request, or 1 week of receipt of additional information or documentation, whichever is later. Acceptance will be in form of Change Order, should a change in Contract cost or time be associated with the substitution.

1. Architect or Owner Representative will not make exhaustive attempt to determine products proposed for substitution are equivalent to, or can be modified in order to be equivalent to specified products.
   a. Where extensive investigation is required by Owner Representative or Architect, as determined by Owner Representative or Architect, Contractor shall reimburse Owner for Owner Representative's or Architect's account for time spent in processing additional resubmittals at rate of 3.2 times rate of Direct Personnel Expense (DPE). Direct Personnel Expense is defined as direct salaries of Architect's or Owner Representative's personnel engaged on Project and portion of costs of mandatory, and customary contributions and benefits related thereto, including employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, pensions, and similar contributions and benefits.
2. Use product specified if Architect and Owner Representative couldn't make decision on use of proposed substitute within time allocated.
3. If accepted by Architect and Owner Representative, products proposed for substitution are accepted subject to modifications by manufacturer, if necessary, to meet detailed requirements of Drawings and Specifications.

B. For Accepted Products: Submit shop drawings, product data, and samples in accordance with Section 01 33 00.

C. Contractor's submittal, and Architect's and Owner Representative's acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with Contract Documents do not constitute acceptable or valid request for substitution, nor do they constitute approval.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 26 13
REQUESTS FOR INTERPRETATION (RFI)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Procedures for submitting requests for interpretation (RFI).

B. Limitations on use of RFI to obtain interpretation and clarification.

1.3 RELATED SECTIONS

A. Section 01 31 13 - Coordination: Requirements for organizing and coordinating the Work.

B. Section 01 31 26- Electronic Communications Protocol

B. Section 01 33 00 - Submittal Procedures: Restriction on use of submittals for changes in materials, products, equipment and systems.

C. Section 01 60 00 – Product Requirements: Procedures for requesting substitutions of materials, products, equipment and systems.

1.4 DEFINITIONS

A. Request for Interpretation: A document submitted by the Contractor requesting clarification of a portion of the Contract Documents, hereinafter referred to as an RFI.

1.5 CONTRACTOR'S REQUESTS FOR INTERPRETATION (RFIs)

A. Contractor's Requests for Interpretation (RFIs): Should Contractor be unable to determine from the Contract Documents the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of Work is described differently at more than one place in the Contract Documents; the Contractor shall request that the Architect make an interpretation of the requirements of the Contract Documents to resolve such matters. Contractor shall comply with procedures specified herein to make Requests for Interpretation (RFIs).

B. Submission of RFIs: RFIs shall be prepared and submitted electronically on a form provided by the Contractor and approved by the Owner Representative.

1. Forms shall be completely filled in and submitted via an Electronic Project Management (EPM) System agreed upon by the Owner Representative.

2. Each RFI shall be given a discrete, consecutive number.

3. Each page of the RFI and each attachment to the RFI shall bear the Owner's project name, project number, date, RFI number and a descriptive title.

4. Contractor shall sign all RFIs attesting to good faith effort to determine from the Contract Documents the information requested for interpretation. Electronic signatures are acceptable and subject to authentication. Frivolous RFIs shall be subject to reimbursement from Contractor to Owner for fees charged by Architect, Architect's consultants and other design professionals engaged by the Owner.

5. RFIs must include the Contractor's understanding of the situation, a recommended solution, and a clear explanation of the problem.

C. Subcontractor-Initiated and Supplier-Initiated RFIs: RFIs from subcontractors and material suppliers shall be submitted through, be reviewed by and be attached to an RFI prepared, signed and submitted by Contractor. RFIs submitted directly by subcontractors or material suppliers will be returned unanswered to the Contractor.

1. Contractor shall review all subcontractor- and supplier-initiated RFIs and take actions to resolve issues of coordination, sequencing and layout of the Work.

2. RFIs submitted to request clarification of issues related to means, methods, techniques and sequences of construction or for establishing trade jurisdictions and scopes of subcontracts will be returned without interpretation. Such issues are solely the Contractor's responsibility.

3. Contractor shall be responsible for delays resulting from the necessity to resubmit an RFI due to insufficient or incorrect information presented in the RFI.

D. Requested Information: Contractor shall carefully study the Contract Documents, in particular, the Contract General Conditions, to ensure that information sufficient for interpretation of requirements of the Contract Documents is not included. RFIs that request interpretation of requirements clearly indicated in the Contract Documents will be returned without interpretation.

1. In all cases in which RFIs are issued to request clarification of issues related to means, methods, techniques and sequences of construction, for example, pipe and duct routing, clearances, specific locations of Work shown diagrammatically, apparent interferences and similar items, the Contractor shall furnish all information required for the Architect or Owner's Representative to analyze and/or understand the circumstances causing the RFI and prepare a clarification or direction as to how the Contractor shall proceed.

2. If information included with this type RFI by the Contractor is insufficient, the RFI will be returned unanswered.

E. Unacceptable Uses for RFIs: RFIs shall not be used to request the following:

1. Approval of submittals (use procedure specified in Section 01 33 00 - Submittals Procedures)

2. Approval of substitutions (refer to Section 01 60 00 - Product Requirements)

3. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Contract General Conditions)

4. Different methods of performing Work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Contract General Conditions).

F. Disputed Requirements: In the event the Contractor believes that an RFI response results in additional cost or time, Contractor shall comply with the Contract General Conditions.

G. RFI Log: Contractor shall prepare and maintain a log of RFIs, and at any time requested by the Owner's Representative, the Contractor shall furnish copies of the log showing all outstanding RFIs.

H. Review Time: Architect will return RFIs to Contractor and Owner's Representative as soon as is practical.

PART 2 - PRODUCTS

Not Applicable to this Section.

PART 3 - EXECUTION

Not Applicable to this Section.

END OF SECTION

SECTION 01 31 13

PROJECT COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Requirements for Project Coordination and electrical and mechanical coordination or “tight” conditions involving Work under Contract.

1.3 RELATED SECTIONS

A. Section 01 11 00 - Summary of the Work: Various types of Work to be coordinated, including Owner-Furnished/Contractor-Installed products and work under separate Contracts

B. Section 01 60 00 - Product Requirements: Coordination of products, especially general requirements for system completeness and product substitutions.

1.4 COORDINATION

A. Coordination, General:

1. Coordinate the Work according to provisions stated in Contract General Conditions. Do not delegate responsibility for coordination to any subcontractor.
    a. Anticipate the interrelationship of all subcontractors and their relationship with the total work.
    b. Resolve differences or disputes between subcontractors and materials suppliers concerning coordination, interference, or extent of work between sections. The Contractor's decisions, if consistent with the Contract Documents, shall be final. The Architect is not required to coordinate work between sections and will not do so.
    c. Coordinate the work of subcontractors and material suppliers, so that their work is performed in a manner to minimize interference with, and to facilitate the progress of the work.
    d. Provide detailing for a complete project.

2. Coordinate Work under the Contract with work under separate contracts by Owner.

3. Coordinate utility and building services shut-downs and closures of vehicular and pedestrian thoroughfares, including access to buildings and parking areas, to minimize disruption of Owner activities.

4. Be responsible for providing anchorage, blocking, joining and other detailing as required to provide complete project.

5. Do not obstruct spaces required by Code in front of electrical equipment, access doors, etc.

6. Do not cover any Work (piping, wiring, ducts, etc.), until properly inspected and approved.

7. Remove and replace any and all Work under any Section which is not in accordance with the Contract Documents with other materials and Work which is in conformance with the Contract Documents. Repair or replace all other Work damaged by these operations at no increase in contract price.

8. This work shall be coordinated with all associated Work in a manner that will insure that all work will be accomplished as rapidly as the progress of the project will permit and so that no work will be delayed for want of associated work.

B. Coordination of OFCI Products: Contractor shall cooperate with Owner and others as directed by Owner's Representative in scheduling and sequencing the incorporation into the Work of Owner Furnished/Contractor Installed (OFCI) products identified in the Contract Drawings and Specifications.

C. Relationship of Contract Documents: Drawings, Specifications and other Contract Documents in the Project Manual are intended to be complementary. What is required by one shall be as if required by all. What is shown or required, or may be reasonably inferred to be required, or which is usually and customarily provided for similar work, shall be included in the Work.

D. Discrepancies in Contract Documents: In the event of error, omission, ambiguity or conflict in Drawings or Specifications, Contractor shall bring the matter to attention of the Architect in a timely manner during the bidding period, for determination and direction by the Architect in accordance with provisions of the Contract General Conditions.

E. Construction Interfacing and Coordination: Layout, scheduling and sequencing of Work shall be solely the Contractor's responsibility.

1. Contractor shall verify, confirm and coordinate field measurements so that new construction correctly and accurately interfaces with conditions existing prior to construction.

2. Contractor shall bring together the various parts, components, systems and assemblies as required for the correct interfacing and integration of all elements of Work. Contractor shall coordinate Work to correctly and accurately connect abutting, adjoining, overlapping and related elements, including work under separate contracts by Owner, utility agencies and companies.

1.5 COORDINATION OF SUBCONTRACTS AND SEPARATE CONTRACTS

A. Superintendence of Work: Contractor shall appoint a field superintendent and a project manager, who shall directly and full time supervise and coordinate all Work of the Contract.

B. Subcontractors, Trades and Materials Suppliers: Contractor shall require all subcontractors, trades, crafts and suppliers to coordinate their portions of Work with the Contractor's field superintendent to prevent scheduling, sequencing, dimensional and other conflicts and omissions.

C. Coordination with Work under Separate Contracts: Contractor shall coordinate and schedule Work under the Contract with work being performed for Project under separate contracts by Owner, serving utilities and public agencies. Contractor shall make direct contacts with parties responsible for work of the Project under separate contracts, in order to provide timely notifications and to facilitate information exchanges.

1.6MEP/UTILITY COORDINATOR

A. MEP/Utility Coordinator: Contractor shall employ and pay for services of a person, technically qualified and administratively experienced in field coordination for the type of mechanical and electrical Work required

for this Project, for the duration of the Work. This responsibility can be assigned to any employee of the General Contractor if they are sufficiently qualified.

1. Work out all "tight" conditions involving work of various sections in advance before installation. If necessary, and before work proceeds in these areas, prepare supplementary drawings for review showing all work in "tight" areas.

2. Provide supplementary drawings and additional work necessary to overcome "tight" conditions at no increase in contract price. Refer to Section 01 33 00, "Submittal Procedures."

3. Coordinated layout shop drawings shall be dimensionally accurate and detailed, giving complete dimensions of all locations, elevations, and clearances. Show exact locations of the following:
   a. Underground Ducts
   b. Piping, including fire protection systems.
   c. Valves and piping specialties, including all air vents and drains.
   d. Dampers
   e. Access points
   f. Control and electrical panels
   g. Remote controllers
   h. Control centers and transformers
   i. Disconnect switches
   j. Irrigation equipment
   k. Electrical and communication main conduits
   l. Storm Drains and related structures.

4. Coordinated layout shop drawings shall show actual architectural and structural constraints and site conditions such as: Structural footings, walls, Tree Protection/Root Protection Zones, etc. which pose potential conflicts with required and/or specified horizontal and vertical dimensions; Architectural elements or elevation requirements conflicting with available space.

5. Coordination:
   a. Fully coordinate work between trades with actual architectural, structural, and site conditions.
   b. Coordinate all adjustments required. Clearly identify by circling these adjustments on the coordinated layout shop drawings.
   c. If Contractor has specific questions regarding coordination of the installation with structural, architectural and site conditions and work between trades, submit same with appropriate shop drawings documenting areas in question with Contractor's proposed installation.

6. Submission and review of coordinated layout shop drawings:
   a. Prepare reproducible drawings.
   b. Submit to each trade for review of space allocated to all trades.
   c. Revise drawings to compensate for review by each trade.
   d. Review revisions with each trade.
   e. Submit to Architect for review.
   f. Review of coordinated layout shop drawings is only for verification that Contractor has performed coordination work as specified herein.

(1) Review does not include verification of exact dimensions, clearances, arrangements and/or compliance with codes.

7. Final coordinated layout shop drawings shall show that all trades affected have made reviews and shall be signed by each trade at completion of coordination.
   a. General Contractor is to assure that each trade has coordinated work with other trades.
   b. Include stamp with labeled space for each trade to sign on each submittal indicating that layout shop drawing has been coordinated.
   c. No layout shop drawing will be reviewed without stamped and signed coordination assurance by General Contractor.

8. Coordinated layout shop drawings showing work of all trades are required. Individual trade layout shop drawings will not be accepted.

9. Verify that utility requirement characteristics of all operating equipment including associated work by others are compatible with the building utilities. Coordinate the Work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

1.7 SUBMITTALS

A. Coordination Documents: Coordinate shop drawings, diagrams and other specified in various product Sections of the Contract Specifications. Submit coordination drawings and schedules as specified below, prior to submitting shop drawings, product data, and samples.

PART 2 - PRODUCTS

Not Applicable to this Section.

PART 3 – EXECUTION

3.1 COORDINATION REQUIRED

A. Coordinate Work specified in Division 22 – Plumbing , Division 26 – Electrical, Division 27 – Communications, Division 31 – Earthwork, Division 32 – Exterior Improvements, and Division 33 - Utilities within each Division, between these Divisions and with Work specified in other Divisions.

B. Coordinate progress schedules, including dates for submittals and for delivery of products.

C. Conduct meetings with suppliers, installers and others concerned with the Work, to establish and maintain coordination of layout, sequencing and completion of various elements of Work.

D. Conduct meetings with installers and others concerned with the Work, to properly integrate various mechanical and electrical systems, to facilitate construction and to provide proper access and work space for maintenance, renovation and improvement of system components. Include participation by representatives of Owner, including maintenance personnel.

E. Assist in resolution of conflicts by providing technical advice, coordination drawings and three dimensional representations of integrated system components, including computer and physical models as necessary.

F. At construction progress meetings, report on progress of Work to be adjusted under coordination requirements and any necessary changes in sequencing and scheduling of Work.

G. Transmit minutes of coordination meetings and reports to Owner’s Representative, Architect, Architect's consultants (as applicable) and to meeting participants.

3.2 COORDINATION DOCUMENTS

A. Coordination Drawings and Models: Contractor shall prepare coordination drawings in computer form and in physical form as necessary, to organize layout and installation of MEP and Utility structures for efficient use of available space, for proper sequence of installation, for integration with existing facilities on-site, for future maintenance and renovation, and to identify potential conflicts between systems and elements.

B. System Services: Contractor shall identify on coordination drawings and models all plumbing and electrical power and signal services required for each component of each system.

1. Contractor shall certify that characteristics of services and controls are correct for each component.

2. Certification shall be in written form and signed by Contractor and mechanical and electrical coordinator.

C. Responsibility and Services Matrix: Prepare a schedule matrix identifying elements of MEP and Utility Work requiring coordination, as specified in each Section of the Contract Specifications.

1. Include identification of parties having responsibilities related to each element of Work and describe what that responsibility shall be.

2. Include required off-site and on-site tests and inspections for various elements of Work.

3. Include identification of administrative activities related to each element of mechanical and electrical Work, such as product data, shop drawings, coordination drawings, samples, mock-ups, test reports for each element of Work.

4. Include identification of elements of Work requiring temporary services.

D. Maintenance and Disposition of Coordination Documentation: Maintain coordination documents, including models, for duration of the Work, recording all changes. After review of original and revised documents and models by Owner’s Representative and Architect, submit documents and models as part of Project record documents. See Section 01 78 39 - Project Record Documents.

3.3 COORDINATION OF SUBMITTALS

A. Submittal Reviews by MEP/Utility Coordinator: In addition to specified review actions by Contractor, specified in Section 01 33 00 - Submittals Procedures, all product data, shop drawings and samples shall be reviewed by the MEP/Utility coordinator for proper coordination of various elements of Work, as described in the preceding Article titled "Coordination Documents."

1. Include Owner-furnished/Contractor-installed (OFCI) products.

2. Include products to be provided (furnished and installed) under separate contracts by Owner, to the extent that information is provided in the Contract Documents and supplemental instructions from Owner’s Representative.

3. Review by Contractor shall be completed prior to submission of product data, shop drawings and samples to Architect for review.

4. Indicate review actions by Contractor by signed review stamp and other appropriate notations on submittals.

5. Coordinate with other review actions to be taken by Contractor, as specified in Section 01 33 00 - Submittals Procedures.

B. Field Conditions: Contractor shall verify field dimensions and clearances and relationship to available space and anchoring provisions. Report conflicts in writing to the Architect and the Owner's Representative.

C. Product Characteristics: Contractor shall:

1. Verify compatibility of equipment and other elements requiring plumbing, HVAC and electrical services and signals with services to be provided.

2. Verify motor voltages and control characteristics.

3. Coordinate controls, interlocks, wiring of pneumatic switches, and relays.

4. Coordinate wiring and control diagrams.

5. Review the effect of changes in one element of the Work of other elements of the Work. Identify conflicts and report conflicts in written and graphic form to the Architect and the Owner's Representative.

6. Verify information provided in maintenance and operating instructions and coordinate preparation of maintenance and operation data. See Section 01 78 23 - Operation and Maintenance Data.

3.4 COORDINATION OF SUBSTITUTIONS AND MODIFICATIONS

A. Review of Proposed Substitutions: See Section 01 25 00- Substitution Procedures. Product Substitution Contractor shall review Contractor's proposals and requests for substitution prior to submission to Architect.

1. Contractor shall verify compliance with Contract Documents and shall certify compatibility with other elements of the Work, including proper integration with building structure, load limitations, operating and maintenance space and accessibility provisions, and suitability for available building services, including plumbing and electrical power and signal systems.

2. Contractor shall prepare and submit recommendation for action regarding proposals, including identification of related changes in other elements of the Work.

3.5 SYSTEM AND EQUIPMENT START-UP

A. Observations of System and Equipment Activation and Start-Up: Contractor shall observe activation and start-up of systems and equipment, including all Work specified in Divisions 2 through 48 with connections to utilities, building services and controls.

1. Contractor shall verify that utilities, building services and control systems are properly connected, complete and functional within criteria of manufacturer and criteria indicated in the Contract Documents.

2. Contractor shall verify that activated elements are properly anchored and that operating components operate properly according to the component's intended design.

3. Contractor shall verify that activated elements of the Work are in operable condition according to normal operating characteristics required by the manufacturer and the Contract Documents.

4. Should adjustments be necessary to activated elements, Contractor shall advise the Architect and Owner's Representative of necessary actions and shall observe that proper actions are performed to achieve required operating characteristics.

B. Observations of System and Equipment Demonstrations: Contractor shall observe performance demonstrations including equipment demonstrations to Architect and Owner's Representative. Record times and additional information required for operation and maintenance manuals.

C. Documentation of Observations of Activation, Start-Up, Adjustment and Demonstration: Contractor shall keep written record of activation, start-up, operational tests and inspections as well as necessary adjustments, re-tests, and re-inspections.

1. Documentation must include a record of the time and date of activation, start-up, operational tests and inspections, and shall include measured results of tests and inspections.

2. Documentation shall be submitted to Owner's Representative and Architect.

3.6 INSPECTION AND ACCEPTANCE OF EQUIPMENT

A. Contract Completion Review:

1. Prior to Contract Completion review, Contractor shall verify that each component and system has been properly adjusted, cleaned, lubricated, inspected and tested, and is ready for operation and use.

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 REQUIREMENTS INCLUDED

A. Preconstruction meeting.

B. Construction progress meetings.

C. Pre-installation conferences.

D. Change Order review meetings

E. Monthly Progress Payment Meetings

F. Contract Closeout Meeting

G. Partnering

1.3 RELATED REQUIREMENTS

A. Section 01 45 00 - Quality Control: General requirements for construction quality, to be reviewed at construction progress meetings.

B. Section 01 32 00 - Construction Progress Documentation: General requirements for construction progress reports, to be reviewed at construction progress meetings.

C. Section 01 33 00 - Submittal Procedures: Status of submittals to be reviewed at construction progress meetings.

D. Section 01 77 00 - Contract Closeout Procedures: Contract Completion Review.

1.4 PRECONSTRUCTION MEETING

A. Preconstruction Meeting: Owner’s Representative will administer a preconstruction meeting immediately prior to Contractor mobilization onto the project site.

1. Representatives of the Owner, the Contractor, selected Subcontractors *[OPTIONAL]*, Architect, and Architect's Consultants *[OPTIONAL]*, and OTHER Park representatives, as appropriate, will attend.

B. Schedule: Schedule preconstruction meeting within five days of construction start date established in the Notice to Proceed.

C. Location: Preconstruction meeting will be held at a location as directed by the Owner’s Representative.

D. Agenda: Preconstruction meeting shall cover the following topics as a minimum.

1. Special Project Procedures: Site access restrictions, if any, and requirements to avoid disruption of operations at adjoining facilities. Present Owner's requirements for use of premises.

2. Designation of Key Personnel: The Owner, Architect, and Contractor shall designate key personnel and provide a name and address list that includes the following.
   a. The Owner: The Owner Representative, Inspector of Record, and others authorized to act in certain capacities for the Owner.
   b. Architect: Principal and Project Administrator as appropriate.
   c. Contractor: Project Manager and Superintendent.
   d. Major subcontractors (as required): Principal/Project Manager and Superintendent.
   e. Major materials suppliers (as required): Contact person.

3. Subcontractors List: Distribute and discuss list of subcontractors and suppliers.

4. Coordination: Review requirements for Contractor's coordination of Work. Review sequence and schedule for work being performed for Owner under separate contracts. Discuss coordination of construction to minimize impacts on continuing Park operations.

5. Project Communication Procedures: Review administrative requirements for written and oral communications.

6. Construction Schedule: Distribute and discuss preliminary schedule, initial baseline construction schedule and critical work sequencing of major elements of Work, including coordination of Owner-Furnished/Contractor-Installed (OFCI) products and work under separate contracts by serving utility agencies and companies and Owner.

7. Park and Site Security: Review requirements for Contractor to develop and implement site security.

8. Safety Program: Review requirements for Contractor to develop and implement safety program in compliance with Contract General Conditions.

9. Site Access by Owner's Representative and Architect: Review requirements and administrative procedures Contractor may wish to institute for identification and reporting purposes.

10. Permits and Fees: Review Contract requirements and review schedule and process for obtaining permits and paying fees.

11. Project Layout: Review requirements for laying out of Work, including surveying requirements.

12. Construction Facilities: Designate storage and staging areas, construction office areas and parking areas and review site access requirements.

13. Temporary Utilities: Requirements for establishing and paying for temporary water, power, lighting and other utility services during construction, including metering and allowances. Refer to Section 01 51 00 - Temporary Utilities.

14. Construction Progress Schedules: Review requirements for preparation and submittal of updating of construction progress and submittals schedules.

15. Payment Procedures: Review requirements for preparation and submission of applications for progress payments and for final payment.

16. Change Procedures: Review requirements and administrative procedures for Change Orders, Field Instructions and Contractor's Requests for Interpretation (RFI).

17. Submittals Administration: Review administrative procedures for shop drawings, product data and samples submittals and review of preliminary Submittals Schedule.

18. Materials and Equipment: Review substitution or equal product requirements; review schedule for major equipment purchases and deliveries; review materials and equipment to be provided by Owner (OFCI products).

19. Testing and Inspection: Review tests and inspections to be performed by the following.
    a. Independent testing and inspection agencies.
    b. Manufacturers and installers.
    c. Service utilities and public agencies.
    d. Authorities having jurisdiction (i.e.: local/county inspectors, Fire Marshall etc.).

20. Operation and Maintenance Data: Format and content of operation and maintenance manuals. Refer to Section 01 78 23 - Operation and Maintenance Data.

21. Instruction of Owner’s Personnel: Review requirements and scheduling of instruction of personnel specified for Demonstration and Training and in various Sections in Divisions 2 through 33 of the Specifications.

22. Starting and Adjusting Procedures: Review requirements of starting and adjusting operating components. Refer to Section 01 75 00 - Starting and Adjusting.

23. Project Record Documents: Review requirements and procedures for preparing, reviewing and submitting project record drawings and specifications.

24. Construction Cleaning: Review requirements for progress and final cleaning specified in Section 01 74 00 - Cleaning Requirements.

25. Contract Closeout: Review requirements specified in Section 01 77 00 - Contract Closeout Procedures, including procedures for filing of Notice of Completion, final payment and submittals.

1.5 CONSTRUCTION PROGRESS MEETINGS

A. Construction Progress (OAC) Meetings: Owner, Architect, Contractor “OAC” Meetings will be held to review progress and quality of construction. The essence of the discussion of each meeting shall be entered into the written record (minutes) of the meeting by the Architect or the Owner Representative designee.

B. Schedule: OAC meetings shall be periodically scheduled throughout progress of the Work. Frequency shall be as determined necessary for progress of Work. Generally, it is intended that construction progress meetings be held at weekly intervals.

C. Administration: The Owner’s Representative shall make physical arrangements for meetings. Architect shall prepare agenda with copies for participants, preside at meetings, record minutes and distribute copies within two working days to Owner’s Representative, Contractor, participants and those affected by decisions made at meetings (theses duties may be shared with the Owner’s Representative or their designee and shall be

determined at the preconstruction meeting). Each discussion item at construction progress meetings shall be numerically identified and carried through subsequent meeting minutes until resolved. Remote attendance of the meeting by personnel who cannot be on-site on a given day is acceptable.

D. Attendance: Contractor's project manager and jobsite superintendent shall attend each meeting. Contractor's subcontractors and suppliers may attend as appropriate to subject under discussion. Owner's Representative will attend each meeting. Architect's consultants will also attend, as appropriate to agenda topics for each meeting and as provided in Owner-Architect Agreement.

E. Suggested Agenda for Each Construction Progress Meeting:

1. Meeting Minutes: Review and correct, if necessary, minutes of previous meeting.
    a. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
    b. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
    c. Challenge to minutes shall be settled as priority portions of "old business" at the next regularly scheduled meeting.

2. Progress of the Work: Since last meeting and proposed progress.
    a. Identify potential problems which might impede progress.
    b. Develop corrective measures and procedures, including but not necessarily limited to additional manpower to regain planned schedule.
    c. Review short-interval "look ahead" construction schedule (current week plus two weeks ahead), including identification of conflicts and delays.

3. Ordering Status: Review status of long-lead time equipment and materials delivery affecting construction progress.

4. RFI Status: Review status of Requests for Interpretation (RFI) status.

5. Submittals Status: Review shop drawings, product data and samples submission and review status.

6. Contract Modifications: Pending Change Orders and Field Instructions. Review status of proposed substitutions.

7. Old Business: Active discussion topics carried over from previous meetings.

8. New Business: New topics of discussion affecting construction progress and quality.

9. Quality Control: Review maintenance of quality standards and identification of non-conforming Work, including proposed remedial measures to be taken by Contractor.

10. Project Record Documents: Status of project record drawings and specifications.

11. Environmental and Safety Issues.

12. Other items affecting progress and quality of the Work.

F. Meeting Time and Location: As mutually agreed by the Architect, the Contractor, and the Owner's Representative at on-site location as well as video-conference option.

G. Special Meetings: As necessary, the Architect, the Contractor, or the Owner's Representative may convene special meetings to discuss specific construction issues in detail and to plan specific activities.

1.6 PRE-INSTALLATION CONFERENCES

A. Pre-Installation Conferences: When specified in individual product specification Sections, convene a preinstallation conference prior to commencing Work specified in individual product Sections.

1. Require attendance by representatives of firms whose activities directly affect or are affected by Work specified in the Section.

2. Review conditions of installation, preparation and installation procedures and coordination with related Work and work under separate contracts.
3. Distribute written notice of agenda, meeting time, and location a minimum of 4 calendar days in advance.

A. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

1. Contract Documents.
2. Options.
3. Related Change Orders.
4. Review of mockups.
5. Possible conflicts.
6. Compatibility problems.
7. Time schedules.
8. Weather limitations.
9. Manufacturer's written recommendations.
10. Installation procedures.
11. Warranty requirements.
12. Compatibility of materials.
13. Acceptability of substrates.
14. Testing and inspecting requirements.
15. Required performance results.

B. Record significant conference discussions, agreements, and disagreements.

C. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

1.7 CONTRACT CLOSEOUT MEETING

A. Contract Closeout Meeting: As specified in Section 01 77 00 - Closeout Procedures.

B. Approximately four (4) to six (6) weeks prior to the scheduled completion of the Project, for the convenience of the contractor, the Owner Representative will include in the standard meeting agenda a Project Close-out meeting.

The purpose of the close-out meeting is to produce an action list of major items required to be completed prior to the issuance of the Notice of Completion.

1. The action list shall assign an action responsibility and a projected action completion date to each item.
2. The contractor shall be solely responsible for the timely completion of all required close-out items.
3. Items to be considered include:
    - Punch list
    - O & M manuals
    - HVAC Balance Report
    - Spare Parts/Materials
    - Keys/Keying
    - Warrantees
    - As-built Drawings and Specifications
    - As-built Schedule
    - State Fire Marshal Inspection
    - Elevator Inspection
    - Other Required Regulatory Inspections
    - Removal of Temporary Facilities
    - Final Cleaning and Pest Control
    - Landscape Maintenance
    - Commissioning/Equipment Startup
    - Acceptance
    - Notice of Completion
    - Final Payment
    - Occupancy

1.9 PARTNERING

A. The Owner’s intent is to encourage the foundation of a cohesive partnership with the Contractor and the Architect. This partnership will be structured to draw on the strengths of each organization in order to identify and achieve reciprocal goals. The objectives are effective and efficient contractor performance, completion within budget, on schedule, and in accordance with the plans and specifications.

PART 2 - PRODUCTS

Not applicable to this Section.

PART 3 - EXECUTION

Not applicable to this Section.

END OF SECTION

SECTION 01 31 26

ELECTRONIC COMMUNICATIONS PROTOCOL

PART 1- GENERAL

1.1 DESCRIPTION

A. This Section is in addition to the Contract General Conditions.

B. The Contractor shall be required to use an Electronic Project Management (EPM) system for electronic construction management document control and communications between the Owner, Architect of Record, other project-related consultants, and the Contractor (aka the Project team). Unless otherwise designated by the Owner, the system will be maintained and owned by the Contractor but operated collaboratively by the Project Team. The EPM that the Contractor chooses shall be approved by the Owner. The Contractor shall be responsible for training the members of the Project team on how to use the EPM at no additional costs to the contract.

C. The Contractor shall be primarily responsible for the scanning, uploading, and logging of all electronic documents for the project as indicated below.

D. The Contractor shall provide personnel and equipment as required by their employees to electronically submit all necessary documents.

E. The EPM system shall contain the following information which shall be made available by the Contractor for the project team:

1. Submittal Information (shop drawings, product data, etc.) and Logs
2. Requests for Information and Logs
3. Inspection Requests / Reports
4. Non-Compliance Inspection Reports
5. Project Photographs
6. Project Meeting Minutes
7. Project FTP Site
8. Contract Documents (including specifications, drawings, reference materials, sketches, ASIs, etc.)
9. Other Documentation as determined by the Owner’s Representative and the Project team.

F. All Request for Information (RFIs) and Inspection Requests shall be submitted by the Contractor to the Owner electronically through the EPM.

G. The Owner will **NOT** accept faxed and/or hand written documentation of RFIs, RFI Sketches, and/or Inspection Requests.
   1. The Contractor shall be solely responsible for data entry via the chosen EPM Website for the generation of RFIs.
   2. The Contractor shall be solely responsible for the scanning of sketches / drawings as necessary for the electronic submittal and attachment of necessary information related to RFIs.
   3. Contractor shall supply field personnel all necessary computer equipment necessary to enter RFIs and other documentation electronically.

H. Submittals shall be submitted via Section 01 33 00 Submittals.

1.2 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall have sufficient computer(s) with capabilities to access the EPM system at their on-site and off-site project offices. At the pre-construction meeting, the Contractor shall provide to the Owner's Representative the contact information (including email addresses) of all Contractor personnel that the Contractor chooses to provide coordination for the EPM system and information. At a minimum, this will include the Contractor's Project Engineer and/or other technical staff as required. These personnel shall have sufficient computer skills required to access the Internet and do basic trouble shooting of the EPM system. The Contractor shall provide training and technical support to the Project team personnel for use of the EPM system. The Contractor shall plan on an average of 4-hours training for each of the Project team personnel who will be using the system. Having the above capability in place onsite is a condition precedent to processing the Contractor's first payment request.

1.3 OFFICIAL RECORDS

A. The documentation and records maintained on the EPM system will be the "Official Records" for the project (not including as-builts created by the Architect). At the conclusion of the project all records shall be made available via Adobe "pdf" and/or other electronic filing methods approved by the Owner Representative for import/export.

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Section Includes:
1. CPM schedules and associated reports.
2. Schedule of Values
3. Daily Reports

1.3 CPM CONSTRUCTION SCHEDULES AND REPORTS

A. General: Comply with the Contract General Conditions.

B. Submittals:

1. Initial Construction Schedule
   a Submit a “Draft” 3-Week Look-ahead Schedule at the Preconstruction Meeting.
   b Within 10 calendar days after issuance of Notice to Proceed, Contractor shall submit a detailed Initial Construction Schedule that includes all construction activities, from Notice to Proceed through Project completion.
   c Within 15 calendar days, the Construction Administrator will review the Initial Construction Schedule and provide comments.
   d Contractor shall revise the Initial Construction Schedule in accordance with Owner comments and resubmit within 15 calendar days. Upon approval by the Owner, the schedule shall be designated as the Contract Construction Schedule.
   e No change to the content or CPM logic of the Contract Construction Schedule shall be made by Contractor without prior approval by the Construction Administrator.
2. Schedule Updates
   a. The Contract Construction Schedule shall be updated and submitted monthly in accordance with the Contract General Conditions.
      1) The updated Contract Construction Schedule shall accurately represent the as-built condition of all completed and in-progress work activities as of the schedule data date.
      2) The Contract Construction Schedule shall use activity codes that allow for logical summarization of like activities. A Summary Schedule of not less than 20 activities shall be submitted monthly with the detailed Contract Construction Schedule.
      3) Prior to preparing the first update of the approved Contract Schedule, Contractor shall designate the approved Contract Schedule as the baseline, or “target schedule”. All

schedule updates shall include the original (i.e. target) information, including start dates, finish dates, durations, successors, predecessors, etc. for each activity.
The actual progress for each activity shall be shown directly below the target bar.

4) Monthly submittals shall include the following items.
   a) Schedule electronic files
   b) A 3-week look-ahead schedule (current week plus two weeks forward), derived directly from the Contract Construction Schedule, shall be updated and submitted for review during each weekly progress meeting. The 3-week look-ahead schedule shall be a sub-network of the Contract Construction Schedule; hand drawn schedules, marked-up versions of previous schedules, or schedules generated using alternate scheduling software will not be accepted.

C. Basic Requirements of Contractor's Scheduling System

1. The Contract Construction Schedule shall be prepared, updated and maintained using the latest version of Primavera Project Planner for Windows or Microsoft Project. Should Contractor request the use of an alternate scheduling software system, a formal Request for Substitution shall be submitted in accordance with section 01 25 00. Should the Owner approve use of an alternate system, Contractor shall be required to provide one legally licensed copy of the software to the Construction Administrator, as well as necessary training in the use of the system, at no additional cost.
2. The system shall be operated by on-site personnel at terminals located in Contractor's site office. On-site management shall be capable of using the system to address all project activities and resources on a real time interactive basis, and capable of rapidly evaluating alternative means and methods in response to job conditions and as required to optimize project management. Contractor's scheduling system shall be capable of providing the following minimum on-site reporting functions:
   a. Precedence Diagram Method (PDM) schedules
   b. Progress reports in tabular formats
   c. Network comparisons
   d. Super and sub-networks
   e. Resource reporting
   f. Report writer allowing flexible formatting and summarization
   g. Graphic output to a laser jet printer or full size plotting device

D. C.P.M. Schedule Format and Requirements

1. Activities shall be coded in a logical manner to allow for sorting and grouping of like characteristics, including but not limited to such items as: phase, work shift, project area, activity type (i.e. submittal, agency review, const. activity, etc.), trade, etc.
2. Include activities and milestones as requested for work completed by Owner under separate contract, Owner furnished materials, move in, etc.
3. The schedule duration shall be calculated using Critical Path Method for the Initial Construction Schedule, Contract Construction Schedule, and all schedule updates.
4. Work activities shall be divided so that no schedule activity shall be less than 1 nor more than 15 work days.
5. A minimum of 5% of the schedule activities shall be designated as milestone activities.
6. Identify work days and non-work days on the schedule.
7. Contractor shall work in conjunction with each subcontractor and supplier to ensure that all relevant submittal, procurement, delivery and installation dates for the various trades are accurately represented in the Initial Construction schedule and each subsequent schedule update.
8. Contractor's Superintendent shall be integrally involved in production of the Initial Construction Schedule and each subsequent update.

9. Include activities for all project submittals as required under Section 01 33 00 and the technical specifications (Divisions 2 through 33).
   a Indicate any required response times for procurement of long-lead items.
10. Failure by Contractor to include any element of the work required for performance of the Contract shall not relieve Contractor of the obligation to complete the entire Work of the Contract in accordance with the Contract Completion Date.
11. Resource-Load the schedule using the actual number of personnel that will be assigned to this project from each subcontractor and trade partner.

E. Construction Schedule Analysis

1. The Contractor shall provide the Owner the following minimum information in the Initial Construction Schedule and subsequent Monthly Updates:
   a. Activity identification code keyed to Summary and Detailed Construction Schedules.
   b. Activity description
   c. Status date and remaining duration
   d. Activity duration
   e. Early start/early finish and late start/late finish
   f. Total float
   g. Free float
   h. Predecessor and successor activity for each individual activity
   i. A listing of all constraints for each individual activity and a justification for using any constraint other than, “as soon as possible.”
   j. A comparison between the current update and the Initial Construction Schedule (baseline schedule).
   k. No more than 20% of the total project activities shall be critical or near critical (less than 5 working days of total float).
2. The Initial Construction Schedule and subsequent Monthly Schedule Updates shall include, but not be limited to, the following information:
   a. NTP Date, mobilization, coordination review and detailing activities.
   b. Submittal preparation by Contractor and review and approval by the Architect and Construction Administrator, including shop drawings, technical manuals and all other submittals. Contractor shall allow at least 21 calendar days for review of submittals.
   c. Order, manufacture, fabrication, delivery and checkout of all long lead and major construction material.
   d. Demolition of existing structures
   e. Earthwork – excavation, backfill and compaction
   f. Initiation and completion of site drainage
   g. Major utility connections
   h. Work interfering with public roads
   i. Initiation and completion of each major underground utility
   j. Pedestrian and Vehicle paving
   k. Completion of each reservable picnic area
   l. Miscellaneous metals and equipment installation
   m. M/E/P finishes - plumbing, electrical, telecommunications,
   n. Sitework – curbs, gutters, hardscape, roads
   o. All utility interfaces
   p. Landscaping
   q. Punch List
   r. Performance and acceptance testing

s. Contractor close-out documentation and training
t. Contractor punch list corrective work
u. Final cleanup
v. Identification of all holidays and non-working days.
w. Milestones listed in Section 00 80 00 – Special Provisions; 1.1

3. The Contractor shall show all tasks and milestones applicable for the project. The Construction Administrator shall be the final arbitrator on the tasks and milestones that should be included in the Initial Construction Schedule and subsequent updates.

F. Submittal Schedule

1. Within 10 working days of Contract Award, and before submitting items for review, generate a schedule of all required and informational submittals. Include anticipated submission dates, required approval dates (no less than 20 working days from submission date), order-by date, and the latest possible material delivery date for each submittal item. Use the naming convention from 01 33 00 – Submittal Procedures to name each submittal.

G. Responsibility for Completion

1. Should any monthly or weekly update of the Contract Construction Schedule indicate that the critical path has been extended, thus impacting the Contract Completion Date, Contractor shall submit a written action plan for bringing the schedule into compliance with the Contract Completion Date. Contractor shall initiate corrective actions, as approved by the Construction Administrator, at no additional cost. These actions shall include, but not be limited to, one or more of the following:
   a. Increase construction manpower in certain or all trades in order to bring the completion date into compliance with Contract requirements.
   b. Increase the number of labor shifts, working hours per shift, or working days per week as required to bring the completion date into compliance with Contract requirements.
   c. Reschedule activities in order to achieve the maximum number of concurrent work activities.
   d. Arrange and pay for acceleration of fabrication schedules for long lead material items.
   e. Arrange and pay for alternate shipping or delivery methods in order to expedite material procurement.

3. Comments provided by the Construction Administrator concerning the Initial Construction Schedule, Contract Construction Schedule, or any schedule update shall not relieve Contractor from the responsibility for compliance with the entire requirements of the Contract Documents.

1.4 SCHEDULE OF VALUES

A. Timing of Submittal: Submit the Schedule of Values within 10 days of the Notice to Proceed. The first progress payment will not be made until the Schedule of Values has been approved by the Owner's Representative.
B. Supporting Data: Upon request, provide sufficiently detailed supporting documents to validate the Schedule of Values and substantiate its accuracy.
   a. List the installed value of each of the identified component parts of the Work in sufficient detail as to quantity and unit price to serve as a basis for computing values for progress payments during construction. Breakdown shall be by line items, for ease of field verification of quantities completed in each line item.
C. Basis of Payment: Once approved, the Schedule of Values is the basis of the Payment Application.
D. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

E. Actual Cost: The cost assigned to a given line item will be considered its actual cost and value. Should a scope of work be removed from the contract, the total cost as shown on the schedule of values will be credited to the Owner.
    a. The schedule of values is based on the Contractor's bid to the Owner.
    b. "Front Loading" of the schedule of values is forbidden. Costs from project scopes later in the schedule cannot be shifted to earlier scopes. Payment will only be made for work that has been completed to the satisfaction of the Owner.
F. Dollar Value: Identify subcontractors and suppliers that will provide materials or work greater than ten thousand dollars ($10,000) or one-half of one percent (0.5%) of the total contract price, whichever is less.
G. Allowances: Any allowances to the contract will be a summary item in the schedule of values. As change orders draw against an allowance, each change order will be added as a subordinate line item to the Allowance.
H. Separate Labor and Materials: Unless specifically agreed to in writing on a case-by-case basis, labor and materials costs will be separate.

1.5 CONSTRUCTION PROGRESS REPORTS

A. Daily Log: Contractor shall maintain a daily log on the EPM Platform with the following information as a minimum:

1. Date.
2. Weather conditions.
3. Subcontractors and trades performing Work under the Agreement on the Site, and number of workers each and number of hours worked by each worker.
4. Others on the Site performing work for the Owner under separate contracts.
5. List of visitors to site, giving name and company or agency affiliation.
6. Descriptions of situations and circumstances which could delay normal progress of Work or which could be basis of claim for change in Contract Time or Contract Sum.
7. Changes to Work and who authorized changes.
8. Comments as Contractor determines are appropriate for Project record.
9. Reports shall include photos and/ or videos as needed to illustrate a particular circumstance more accurately.

B. Submission of Logs: Make daily logs available on EPM Platform by 10:00 AM the following work day. Export and deliver compiled daily logs every Monday. Weekly packages must include all subcontractor and trade partner reports as well as any quality control reports, safety reports, or other records that were produced during the previous week.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Administrative requirements

B. Construction Progress Schedule Submittal

C. Contractor's review of submittals.

D. Architect's review of submittals.

E. Product data submittals.

F. Shop drawing submittals.

G. Sample submittals.

H. Manufacturer’s Instructions

I. Reports of results of tests and inspections.

J. Operations and Maintenance Data submittals

K. Certificates

1.3 RELATED SECTIONS

A. Section 01 31 13 – Project Coordination

B. Section 01 31 26 – Electronic Communications Protocol

C. Section 01 45 00 - Quality Control: Test and inspection reports.

D. Section 01 77 00 - Closeout Procedures: Submittals for occupancy, Acceptance and Final Payment.

E. Section 01 78 23 - Operation and Maintenance Data: Requirements for preparation and submission.

1.4 DEFINITIONS

A. Shop Drawings, Product Data and Samples: Instruments prepared and submitted by Contractor, for Contractor's benefit, to communicate to Architect the Contractor's understanding of the design intent, for review and comment by Architect on the conformance of the submitted information to the general intent of the design. Shop drawings, product data and samples are not Contract Documents. Drawings, diagrams, schedules and illustrations, with related notes, are specially prepared for the Work of the Contract, to illustrate a portion of the Work.

B. Product Data: Standard published information ("catalog cuts") and specially prepared data for the Work of the Contract, including standard illustrations, schedules, brochures, diagrams, performance charts, instructions and other information to illustrate a portion of the Work.

C. Samples: Physical examples that demonstrate the materials, finishes, features, workmanship and other characteristics of a portion of the Work. Accepted samples shall serve as quality basis for evaluating the Work.

D. Other Submittals: Technical data, test reports, calculations, surveys, certifications, special warranties and guarantees, operation and maintenance data, extra stock and other submitted information and products shall also not be considered Contract Documents but shall be information from Contractor to Architect to illustrate a portion of the Work for confirmation of understanding of design intent.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Administrative Requirements for Submittals: Submittals shall be made in accordance with requirements specified herein and in other Divisions of the Specifications. See also the Contract General Conditions for additional requirements; especially those regarding requests for alternatives or equals and for substitutions.

1. All required submittals, with the exception of O&M manuals, close-out submittals, and mock-ups required to be installed concurrent with specific construction activities, shall be submitted within 60 calendar days after Notice to Proceed.

B. Contractor Coordination of Submittals: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
    a. The Architect will return without action submittals requiring coordination with other submittals until related submittals are coordinated.

C. Submittal Log: Prior to proceeding with affected work, Contractor shall prepare and submit a Submittal Log, which lists submittal items per the product specifications for review and approval by Owner’s Representative and Architect. Contractor shall allow a minimum of (10) calendar days for Owner review. Submittal Log shall identify all specified submittals to be made and shall serve as checklist for submittals.

1. Maintain accurate submittal log for duration of Contract. Indicate current status of all submittals at all times. Submit log at progress meeting and as otherwise requested by Owner Representative or Architect.
2. Format shall be suitable for Project and shall be subject to acceptance by Owner’s Representative and the Architect.
    a. Include columns to track fabrication and manufacturing time, shipping lead times, and the date that materials must be on-site to proceed with the work on-schedule.

3. Comply with directions by Owner's Representative and the Architect for scope and format of the Submittal Log. With the Submittal Log, produce a Submittal Table demonstrating which types of submittals from this list are required from each Section of the Specifications.

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a. Include the following submittal types and headings:

SD = Shop Drawings are required
PD = Product Data required
SA = Samples required
CO = Color samples required
SS = Site Sample installations are required
LM = List of Materials
RD = Record Drawings required
CE = Certificates are required
PR = Manufacturer's instructions or specifications required
OM = Operation and Maintenance manuals are required
EQ = Maintenance materials/equipment are required
WA = Warranties and/or guarantees are required
LR = Laboratory Reports are required
FT = Factory Test reports are required
ST = Site Test reports required
RP = Submittal to the Architect for record purposes only and not for review or approval
O = Other submittal requirements as specified in Section

4. Sample Table:

Section	SD	PD	SA	CO	SS	LM	RD	CE	PR	OM	EQ	WA	LR	FT	ST	RP	O
05120	x					x											
09250		x			x	x		x					x		x		
10810		x	x														

D. Transmission of Submittals: Submittals shall be processed electronically (with exceptions such as product and material samples or otherwise designated or approved by the Owner Representative). Transmit all submittals from Contractor to Architect via Electronic Project Management (EPM) system, unless otherwise directed, using a transmittal form for each one. Submittals received from sources other than the Contractor will be returned without action. Include all information specified below for identification of submittal and for monitoring of review process.

1. The template Transmittal letter from the EPM Platform will be acceptable.

2. Submittals shall be concurrently made available via EPM to Owner's Representative for review.

E. Timing of Submittals: Make submittals sufficiently in advance of construction activities to allow shipping, handling and review by the Architect and Architect's consultants. Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.

1. The Architect will make desired corrections and consolidate relevant Owner comments within fifteen (15) work days and return the submittal to the Contractor via EPM system. Submittals, which require coordination with other submittals, may require more than fifteen (15) calendar days review time. Submittals that require selection of colors will be reviewed. Color selection may not be provided until all submittals requiring color selection have been received and reviewed, and color selections have been approved by the Owner.

2. Make corrections required by the Architect and submit via EPM system for final review and distribution.

3. If an intermediate submittal is necessary, process the same as the initial submittal.

4. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

F. Submittals Identification:

1. Provide a space on all submittals electronically approximately four-inches by five-inches on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken. Include the following information on the label for processing and recording action taken:

   a. Project name and Owner project number
   b. Submission date
   c. Name and address of Architect
   d. Name and address of Contractor
   e. Name and address of subcontractor
   f. Name and address of supplier
   g. Name of manufacturer
   h. Number and title of appropriate Specification Section
   i. Drawing number and detail references, as appropriate.

2. Identify each element on submittal by reference to Drawing sheet number, detail, schedule, room number, assembly or equipment number, Specifications article and paragraph, and other pertinent information to clearly correlate submittal with Contract Drawings. On the submittal transmittal form or separate sheet record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information submitted complies with requirements of the Contract Document. The Architect’s review of such submittals or shop drawings or product data shall not relieve the Contractor of responsibility for deviations from the drawings or specifications.

3. Submittal Naming Convention: Identify each submittal by;

   i Specification Section number followed by a number indicating sequential submittal for that Section. Separate the Specification section from the submittal number with a hyphen (-)

      1 Resubmittals use the same first series of numbers followed by two digit decimal indicating sequential resubmittal (01.01, 01.02, 01.03, etc.). End the string of numbers with an Underscore (_)

   ii Clearly title the submittal based on its content (Plaster Mix Design, Plaster Finish Sample, etc.)

iv Sample Submittal Titles;

v 092613-01.01_ First submittal for Section 09 26 13
vi 092613-02.01_ Second submittal for Section 09 26 13
vii 092613-02.02_ Resubmittal of second submittal for Section 09 26 13
viii 092613-02-03_Second resubmittal of second submittal for Section 09 26 13

4. Place a permanent label or title block on each submittal electronically for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

G. Grouping of Submittals: Unless otherwise specifically permitted by the Architect, make all submittals in groups containing all associated items (Example: All Division 32 Submittals relating to Irrigation would be submitted at the same time). The Architect may reject partial submittals as incomplete or hold them until related submittals are made.

H. Unsolicited Submittals: Unsolicited submittals may be returned without being reviewed.

I. Record Submittals: When record submittals are specified, submit in accordance with the Electronic Project Management System requirements. Record submittals will not be reviewed but will be retained for historical and maintenance purposes.

J. Revisions: Revisions to original submittal list and schedule will only be accepted by Owner Representative and Architect when revisions are required by circumstances not reasonably anticipated by Contractor during preparation of original schedule. Submit revisions not later than 20 calendar days following the date that the need for revision became necessary.

1.6 CONSTRUCTION PROGRESS SCHEDULE SUBMITTAL

A. Submit as specified in the Contract General Conditions under Schedule and Section 01 32 00 for Construction Progress Documentation.

1.7 CONTRACTOR'S REVIEW OF SUBMITTALS

A. Contractor's Review of Submittals: Prior to submission to Architect for review, Contractor shall review each submittal for completeness and conformance to specified requirements. Contractor shall stamp each submittal with a review action stamp and sign each copy of submittal. Submittals without stamp and signature will not be reviewed and will be returned. Electronic signatures are acceptable but will need to be authenticated during the submittal process. Contractor's submittal action stamp shall certify the following actions by Contractor:

1. Field measurements have been determined and verified.

2. Conformance with requirements of Contract Drawings and Specifications is confirmed.

3. Catalog numbers and similar data are correct.

4. Work being performed by various subcontractors and trades is coordinated.

5. Field construction criteria have been verified, including confirmation that information submitted has been coordinated with the work being performed by others for Owner and actual site conditions.

6. All deviations from requirements of Drawings and Specifications have been identified and noted.

7. Contractor shall certify that submittals have been reviewed and approved:

Stamp Submittals utilizing the following language:

"The undersigned certifies this submittal has been reviewed and approved with respect to the means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incidental thereto; and also warrants that this submittal complies with the Contract Documents and comprises no variation thereto. Signature:_____Date:_____ Name Printed: _____Title_____ Contractor Name:_____

8. Submittals not certified by being stamped and signed by Contractor electronically will be returned without action, as will submittals which, in Owner Representative's or Architect's opinion, have not been adequately reviewed and coordinated by Contractor.

B. Changes in Work: Changes in the Work shall not be authorized by submittal review actions. No review action, implicit or explicit, shall be interpreted to authorize changes in the Work. Changes shall only be authorized by separate written direction from the Owner Representative, in accordance with the Contract General Conditions.

C. Allow sufficient review time so that installation will not be delayed as result of time required to process submittals, including time for resubmittals.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related elements of Work so processing will not be delayed by need to review submittals concurrently for coordination.
   a. Owner Representative and Architect reserve right to withhold action on submittal requiring coordination with other submittals until related submittals are received.
3. Allow additional time if processing must be delayed to permit coordination with subsequent submittals.
4. If intermediate submittal is necessary, process same as initial submittal.
5. Allow same time for reprocessing each submittal as allowed for processing original submittal.
6. No extension of Contract Time will be authorized because of failure to transmit submittals to Owner Representative sufficiently in advance of Work to permit processing.

D. Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Owner Representative using Submittal Transmittal form attached at the end of this section.

1. Submittals received from sources other than Contractor will be returned without action.
2. Number each submittal and resubmittal as indicated in approved Submittal Schedule.
3. Submittals forwarded without a completed Submittal Transmittal form will be returned without review.
4. Submittals shall be submitted electronically unless they are related to materials and products.

1.8 REVIEW OF SUBMITTALS BY OWNER'S REPRESENTATIVE AND ARCHITECT

A. Review of Submittals by Owner's Representative and Architect: Submittals shall be a communication aid between Contractor and Architect by which interpretation of Contract Documents requirements may be confirmed in advance of construction.

1. Reviews by Owner's Representative, Architect and Architect's consultants shall be only for general conformance with the design concept of the Project and general compliance with the information given in the Drawings and Specifications.

2. The Architect's review shall not be construed as an "approval," or to relieve the Contractor(s) and material suppliers of responsibility for errors or omissions in the submitted documents.

3. Acceptance of a specific item does not include acceptance of the assembly of which the item is a component.

4. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly via EPM system.

B. Review Action: Architect will stamp each submittal with a uniform, self-explanatory action stamp.

1. Stamp will be appropriately marked as follows to indicate the action taken:

a. Action 1 (no exception taken): Means fabrication, manufacture, or construction may proceed providing submittal complies with Contract Documents.

b. Action 2 (make corrections noted; no resubmission required): Means fabrication, manufacture, or construction may proceed providing submittal complies with Architect's notations and Contract Documents. (Note: If Contractor cannot comply with notations, make revisions and resubmit.)

c. Action 3 (make corrections noted; submit corrected copy): Means fabrication, manufacture, or construction may proceed; however, submittal did not fully demonstrate full extent of all conditions, details and coordination with other surrounding work and therefore requires additional information and rework as noted. Resubmit shop drawings for final Action 1 or 2. Should Contractor proceed with fabrication, manufacturing or construction, it shall do so at its own risk.

d. Action 4 (rejected, revise and resubmit): Means submittal does not comply with design intent of Contract Documents. Do not use submittals stamped Action 3. Make revisions and resubmit.

e. Action 5 (rejected, submit specified item): Means submittal varies from specified item or system specified in Contract Documents and is not acceptable for use on the project. Do not use submittals stamped Action 4. Make revisions and resubmit.

f. Action 6 (resubmit with related assembly items): Means submittal of related assembly item(s) are required in conjunction with the submittal for proper review.

g. Action 7 (rejected; incorrect transmittal): Means the Submittal Transmittal form specified for use on the Project was not included, incomplete, or incorrectly completed.

h. Action 8 (No Action): Means documents have not been reviewed by Architect and submittal is returned to Contractor for several possible reasons: submittal not requested, submittal not complete, submittal not coordinated, or submittal bears no resemblance to design intent.

i. Action 9 (submitted to consultant for review): This code is for the use of the Architect to indicate routing to various A/E consultants. Any submittals marked Action 6 by Architect will be returned to Contractor without review.

j. Record Submittals: Specifications require certain information and calculations be submitted for record purposes only. Such submittals will not be acted upon, stamped or returned to Contractor.

2. Do not permit submittals marked "Rejected, Revise and Resubmit" to be used at the Project site, or elsewhere where Work is in progress.

3. Note: Any work performed prior to receiving a fully approved submittal shall be done at the Contractor's risk and shall be subject to being replaced if Contract requirements are not met.

C. Contract Requirements:

2. Review actions by Architect and Architect's consultants shall not relieve the Contractor from compliance with requirements of the Contract Drawings and Specifications.

a. Acceptance of submittals with deviations shall not relieve Contractor from responsibility for additional costs of changes required to accommodate such deviations.

b. Deviations included in submittals without prior acceptance will be considered an exception from review of submittals whether noted or not on returned copy.

3. No review action, implicit or explicit, shall be interpreted to authorize changes in the Work. Changes shall only be authorized by separate written Change Order or Field Instruction, in accordance with the Contract General Conditions.

4. When professional certification of performance criteria of materials, systems or equipment is required by Contract Documents, Owner Representative and Architect shall be entitled to rely upon accuracy and completeness of such calculations and certifications.

5. Notations by Owner Representative or Architect which increase contract cost or time of completion shall be brought to Owner Representative’s and Architect's attention before proceeding with Work.

D. Resubmittals:

1. Subject to same terms and conditions as original submittal.
2. Owner Representative and Architect will accept not more than one resubmittal.
   a. Should additional resubmittals be required, Contractor shall reimburse Owner for Owner Representative and Architect's accounts for time spent in processing additional resubmittals at rate of 2.5 times rate of Direct Personnel Expense (DPE). Direct Personnel Expense is defined as direct salaries of Owner Representative’s and Architect's personnel engaged on Project and portion of costs of mandatory, and customary contributions and benefits related thereto, including employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, pensions, and similar contributions and benefits.

1.9 PRODUCT DATA SUBMITTALS

A. Product Data: Catalog cuts, photographs, illustrations, standard details, standard schedules, performance charts, material characteristics, color and pattern charts, test data, roughing-in diagrams and templates, standard wiring diagrams and performance curves and listings by Code authorities and nationally-recognized testing and inspection services. Where product data must be specially prepared because standard manufacturer data is not suitable for use, submit according to requirements for shop drawings specified below.

B. Modifications to Standard Product Data: Modify manufacturer's standard catalog data to indicate precise conditions of the Project.

1. Provide space for review action stamps and, if required by authorities having jurisdiction, license seal of Engineer and/or design consultant, if applicable.

2. Mark each copy to show applicable choices and options. Where manufacturer’s product data includes information on several products, some of which are not required, mark copies to highlight applicable information.

3. Include the following information:

a. Manufacturer's literature with recommendations,
b. Compliance with recognized trade association standards,
c. Compliance with recognized testing agency standards,
d. Application of testing agency labels and seals,
e. Notation of dimensions verified by field measurement,

f. Notation of coordination requirements,

4. Do not submit product data until compliance with requirements of the Contract Documents has been confirmed.

5. Proceed with installation only using reviewed copy of product data with appropriate action stamp as indicated in Section 1.8 B1 above. Do not permit use of unmarked copies of product data in connection with construction.

C. Copies: Submit electronic copies of catalog pages with applicable data highlighted and cross-referenced to Drawings and Specifications requirements. Paper copies will not be acceptable unless specifically authorized by the Owner Representative. Distribution of approved submittals shall be electronic unless otherwise noted.

1.10 SHOP DRAWINGS SUBMITTALS

A. Shop Drawings: Drawings, diagrams, schedules and other graphic depictions to illustrate fabrication and installation of a portion of the Work. Shop Drawings shall include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

1. Identification of products and materials included

2. Compliance with referenced standards

3. Notation of coordination requirements

4. Dimensions

5. Notation of dimensions established by field measurement.

B. Coordination: Show all field dimensions and relationships to adjacent or critical features of Work.

C. Preparation of Shop Drawings: submit electronically prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

1. Provide space for review action stamps and, if required by governing authorities having jurisdiction, license seal of Architect and Architect's design consultant, if applicable.

2. Prepare shop drawings submitted in electronic format that shall be printable on minimum sheet size of 17-inches by 22inches, or smaller if a multiple of 8-1/2 inches by 11-inches. Maximum size shall be 30-inches by 42-inches.

3. Except as otherwise approved by the Owner Representative, submit all shop drawings electronically using the Contractor’s Electronic Project Management system.

4. Do not use Shop Drawings without an appropriate final review stamp indicating action taken in connection with construction.

D. Distribution of Reviewed Shop Drawings: Electronic distribution of reviewed shop drawings will be by Contractor and must be stamped by the Architect.

1.11 SAMPLE SUBMITTALS

A. Samples: Full-size, fully-fabricated samples cured and finished as specified and physically identical with the material or product proposed. Samples shall include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.

1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to include the following:

a. Project name and location

b. Manufacturer and supplier.

c. Name, finish, and composition of material.

d. Location where material is to be used.

e. Specification Section number.

f. Submittal number.

g. Contractor's review stamp.

h. Space for Architect's review stamp.

i. Compliance with recognized standards

j. Availability and delivery time.

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

3. Submit actual samples. Photographic or printed reproductions will not be accepted.

4. Field samples specified in individual Sections are special types of samples. Field samples shall be full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the Work will be evaluated.

B. Preliminary or Selection Submittals: Where samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit full set of choices for the specified material or product.

1.Preliminary submittals will be reviewed and returned with the Architect's mark indicating selection and other action.

C. Quantity: Except for samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit three sets. One sample will be returned marked with the action taken.

1. Maintain sets of samples, as returned, at the Project site, for quality comparisons throughout the course of construction.

2. Unless otherwise noted, full-size and complete samples will be returned and may be incorporated into field mock-ups. Samples may be incorporated into the Work (completed construction) only with written approval of the Architect and the Owner Representative in advance of sample preparation.

3. Other samples shall be produced and mounted on cardstock in 8-1/2" by 11" format, three-hole punched and suitable for inclusion in product sample binders. Contractor shall provide binders as directed.

4. Contractor shall prepare and distribute additional samples to subcontractors, manufacturers, fabricators, suppliers, installers, and others as necessary for performance of the Work.

5. Accepted samples will form standard of comparison for finished Work. Defects and deviations in excess of those in accepted samples, are unacceptable and are subject to rejection of completed Work.

D. Color Samples: Architect will review and select colors for Project only after all colors are received, so that colors may be properly coordinated.

E. Review of Field Samples: Review by Architect of field samples will be made for the following products if not otherwise required and if requested by Contractor.

1. Sedimentary Concrete structures at reservable picnic areas.

2. Paving and Pedestrian walkways

3. Metal edging at pathway perimeter

4. Granite countertops

5. Stone Barbecues

6. Architectural fencing

7. Landscaping and planting

1.12 MANUFACTURER'S INSTRUCTIONS

A. Manufacturer's Instructions: Submit manufacturer's instructions for preparation, mixing, assembly, handling, application and installation of products, as applicable and as specified in product sections of the Specifications.

1. Include applicable ICBO ES Evaluation Reports. Evaluation Reports shall be current and shall be annotated for applicable products.

2. Include applicable Safety Data Sheets (SDS), for Project record only.

3. Include written recommendations, as applicable, from manufacturer for Project conditions.

4. Identify conflicts between manufacturers' instructions and Contract Documents.

B. Copies: Electronic distribution will be required. If requested and agreed to by the Owner Representative, copies may be distributed as necessary.

C. Reviews by Architect and Owner’s Representative: Manufacturer's instructions shall be for information and will not be reviewed by Architect or Owner’s Representative.

1.13 REPORTS OF RESULTS OF INSPECTIONS AND TESTS

A. Reports of Results of Inspections and Tests: Submit technical data, test reports, calculations, surveys, and certifications based on field tests and inspections by independent inspection and testing agency and by authorities having jurisdiction.

1. Reports of results of inspections and tests shall not be considered Contract Documents.

2. Refer to Section 01 45 00 - Quality Control for additional requirements.

1.14 OPERATION AND MAINTENANCE DATA SUBMITTALS

A. Operation and Maintenance Data Submittals: Refer to requirements specified in Section 01 78 23 - Operation and Maintenance Data. Include operation and maintenance data submittals in Construction Progress Schedule. Refer to Contract General Conditions.

1.15 CERTIFICATES

A. When specified in individual specification Sections, submit manufacturers' certificates to Architect through Electronic Project Management system for review as specified.

B. Submit in form of letter or company standard forms, signed by officer of manufacturer.

C. Each certification shall include the following:

1. Project name and location.

2. Contractor's name and address.

3. Quantity and date or dates of shipment or delivery to which certificate applies.

4. Manufacturer's name.

D. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

E. Certificates may be recent or previous test results on material or product, but must be acceptable to Owner Representative and Architect.

PART 2 - PRODUCTS

Not applicable to this Section.

PART 3 - EXECUTION

Not applicable to this Section.

END OF SECTION

SECTION 01 35 00

SPECIAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

1. Environmental protection procedures
2. Smoke/odor control procedures
3. Noise control procedures
4. Dust and air pollution control procedures
5. Hazardous materials procedures
6. Welding and burning mitigation procedures
7. Erosion and sediment control procedures (Storm Water Pollution Protection Plan)
8. Disposal operations procedures
9. Cultural resources procedures
10. Alteration project procedures.
11. Equipment Repair

1.3 RELATED SECTIONS

A. Section 01 73 29 - Cutting and Patching: General requirements for procedures and limitations for cutting and patching the work.

1.4 ENVIRONMENTAL PROTECTION PROCEDURES

A. Environmental Protection Procedures: General requirements specified in this Section are in addition to those of the Contract General Conditions.

1. During the progress of the work, keep the premises occupied in a neat and clean condition and protect the environment both on site and off site, throughout and upon completion of the construction project.
2. In coordination with the Park, develop an Environmental Protection Plan in detail and submit to Owner’s Representative for approval within 30 working days from the date of commencement specified in the Notice to Proceed. Distribute approved plan electronically to all employees and to all subcontractors and their employees. Environmental Protection Plan shall include, but not be limited to, the following items:

a. Required permits
b. Proposed sanitary landfill site
c. Other proposed disposal sites
d. Noise Control
e. Dust Control
f. Erosion and Sediment Control
g. Any agreements with public or private landowners regarding equipment, materials storage, borrow sites, fill sites, or disposal sites. Such agreements made by Contractor shall be invalid if their execution causes violation of local or regional grading or land use regulations.

B. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result.

1. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

2. Comply with noise control requirements specified below.

C. Construction Operations: All construction operations shall comply with all applicable Federal, State and local Codes, ordinances, statutes and regulations pertaining to water, air, solid waste and noise pollution. It shall be Contractor's responsibility to identify and determine necessary measures to be taken to comply with such Codes, ordinances, statutes and regulations. D. Definitions of Contaminants:

1. Sediment: Soil and other debris that have been eroded and transported by runoff water

2. Solid waste: Rubbish, debris, garbage and other discarded solid materials resulting from construction activities, including a variety of combustible and non-combustible wastes, such as ashes, waste materials that result from construction or maintenance and repair work, leaves and tree trimmings

3. Chemical waste: Includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, disinfectants, organic chemicals and inorganic wastes. Some of the above may be classified as "hazardous"

4. Sanitary wastes:
   a. Sewage: Domestic sanitary sewage
   b. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing and consumption of food.

E. Hazardous Materials: See also Section below titled "HAZARDOUS MATERIALS PROCEDURES."

1. Except as otherwise specified, in the event the Contractor encounters on the site material reasonably believed to be asbestos, lead, polychlorinated biphenyl (PCB), or other hazardous materials which have not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner in writing.

2. Work in affected areas shall not thereafter be resumed except by written agreement of the Owner and Contractor if in fact the material is asbestos, lead, PCB, or other hazardous materials and has not been rendered harmless.

3. Work in affected areas shall be resumed in the absence of asbestos, lead, PCB, or other hazardous materials, or when such materials have been rendered harmless.

F. Protection of Natural Resources: It is intended that the natural resources within the Project boundaries and outside the limits of permanent work performed under this Contract be preserved in their existing condition or be restored to an equivalent or improved condition upon completion of the work. Confine construction activities to areas defined by the public roads, easements, and work area limits shown on the drawings. Return construction areas to their pre-construction elevations except where surface elevations are otherwise noted to be changed. Maintain natural drainage patterns. Conduct construction activities such that ponding of stagnant water conducive to mosquito breeding habitat will not occur at any time.

1. Land resources protection: Do not remove, cut, deface, injure or destroy trees or shrubs outside the work area limits. Do not remove, deface, injure or destroy trees within the Project area without permission from Owner's Representative. Such improvements shall be removed and replaced, if required, by the Contractor at no change in Contract Time and Contract Sum.

2. Landscaping protection: Protect trees that are located near the limits of Project area which may possibly be defaced, bruised or injured or otherwise damaged by the Contractor's operations. No ropes, cables or guys shall be fastened to or be attached to any existing nearby trees or shrubs for anchorages. Refer to additional requirements specified in Section 01 56 00 - Temporary Barriers and Controls.
   a. Trimming: Refer to Section 01 56 39 - Tree and Plant Protection.
   b. Excavations around trees: Refer to Section 01 56 39 - Tree and Plant Protection.
   c. Repair and restoration: Repair or replace trees or other landscape feature scarred or damaged by equipment or construction operations as specified below. Repair and restoration plan shall be reviewed and approved by Owner's Representative prior to its initiation.

3. Temporary construction:
   a. Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction as directed by the Owner's Representative.
   b. Level all temporary roads, parking areas and any other areas that have become compacted or shaped.
   c. Unpaved areas where vehicles have been operated shall receive suitable surface treatment or shall be periodically wetted down to prevent construction operations from producing dust damage and nuisance to persons and property, at no additional cost to the Owner.
   d. Keep haul roads clear at all times of any object that creates an unsafe condition. Promptly remove any contaminants or construction materials dropped from construction vehicles. Do not drop mud and debris from construction equipment on public streets. Sweep clean turning areas and pavement entrances as necessary.

4. Water resources: Comply with all applicable Federal, State and local Codes, ordinances, statutes and regulations pertaining to discharge (directly or indirectly) of pollutants to underground and natural waters.
   a. Perform all Work under the Contract in a manner that any adverse environmental impacts are reduced to a level that is acceptable to Owner's Representative and authorities having jurisdiction.
   b. Refer to Division 2 - Site Construction, earthwork Sections, and Civil Drawings for specific requirements on control of storm water and disposal of water from dewatering activities.

5. Oily Substances: At all times, special measures shall be taken to prevent oily or other hazardous substances from entering the ground, drainage areas or local bodies of water in such quantities as to affect normal use, aesthetics or produce a measurable impact upon the areas. All soil or water that is contaminated with oily substances due to Contractor's operations shall be disposed of in accordance with applicable regulations, at no change in Contract Time and Contract Sum.

1.5 SMOKE/ODOR CONTROL PROCEDURES

A. Smoke/Odor Control: Protect primary fresh air intakes to existing buildings from exhaust from internal combustion engines, paint and solvent fumes and other noxious fumes and vapors.

1. Implement control methods such as snorkels from engines exhausts to 50 feet away from air intakes. Provide carbon filters on air intakes as necessary, including periodic replacement of filters to ensure effectiveness.

2. All other activities generating fumes shall be limited to minimum distance of 50 feet from air intake grilles.

3. If fume-generating procedures must occur within 50 feet of an air intake, Contractor shall do the following:
   a. Notify Owner's Representative at least 14 calendar days in advance of such activities.
   b. Perform Work when it least impacts the Owner (evenings, weekends or particularly windy days).
   c. Provide carbon filter media, plastic barriers, or other control methods to ensure fresh air only enters into the building ventilation system.

1.6 NOISE CONTROL PROCEDURES

A. Noise Control Procedures, General: Requirements of this Section are in addition to those of the Contract General Conditions. Maximum noise levels within 100 feet of residences, businesses, playgrounds, adjacent buildings and other populated areas:

1. Noise levels for trenchers, pavers, graders and trucks: Not exceeding 90 dBA at 50 feet as measured under noisiest operating conditions.

2. Noise levels for all other equipment: Not exceeding 85 dBA at 50 feet.

B. Noise Control of Equipment:

1. Equip jackhammers with exhaust mufflers and steel muffling sleeves.

2. Use air compressors of a quiet type such as a "whisperized" compressor. Compressor hoods shall be closed while equipment is in operation.

3. When practical, use electrically-powered rather than gasoline or diesel powered fork-lifts.

4. Provide portable noise barriers around jack hammering, with barriers constructed of 3/4 inch plywood lined with 1-inch thick duct-liner type fiberglass on Work side. C. Noise Control of Construction Operations:

1. Keep noisy equipment as far as possible from noise-sensitive site boundaries.

2. No idling equipment.

3. Use electric power in lieu of internal combustion engine power whenever possible.

4. Maintain equipment properly to reduce noise from excessive vibration, faulty mufflers, or other sources. All engines shall have properly functioning mufflers.

D. Scheduling of Noisy Operations: Schedule construction activities to minimize time of noisy operations and disruption to occupants of adjoining facilities. Notify Owner's Representative in advance of performing Work creating unusual noise and schedule such Work at times mutually agreeable.

E. Accessory Noise: Do not play radios, tape recorders, televisions, and other similar items at construction site.

1.7 DUST AND AIR POLLUTION CONTROL PROCEDURES

A. Dust and Air Pollution Control Procedures: The requirements of this Section are in addition to those of the Contract General Conditions, Project Drawings, and other Specification Sections. Employ measures to prevent or minimize creation of dust and air pollution. Contractor shall appoint a dust control monitor to oversee and implement all measures specified in this Article.

1. Unpaved areas shall be wetted down, to eliminate dust formation, a minimum of twice a day to reduce particulate matter. When wind velocity exceeds 15 mph, site shall be watered down more frequently.

2. Store all volatile liquids, including fuels or solvents in closed containers.

3. No on-site burning of debris, lumber and other scrap shall be permitted.

4. Properly maintain equipment to reduce gaseous pollutant emissions.

5. Exposed areas, new driveways and sidewalks shall be seeded, treated with soil binders or paved, as appropriate, as soon as possible.

6. Cover stockpiles of soil, sand and other loose materials.

7. Cover trucks hauling soil, debris, sand or other loose materials.

8. Clean project area streets at least once daily. Refer to Section 01 74 00 - Cleaning Requirements as well as Sheet C1.0; Section I, Note 20; and Section IV, Note 8

1.8 HAZARDOUS MATERIALS PROCEDURES

A. Identified Hazardous Materials:

1. Limited hazardous materials investigations have been conducted for the Owner by TERRACON CONSULTANTS, INC., the results of which are in a document titled "[*_TITLE_*]" dated [*_DATE_*]. This report is furnished to Contractor as Information Available to Contractor. The report is included in the Project Manual as Appendix [_____]. **This paragraph will be updated in an addendum to include the report and the appendix will be added to the manual.**

2. Contractor shall perform hazardous materials abatement in compliance with requirements described in the document identified above. Costs and time associated with abatement of hazardous materials identified in this report shall be included in the Contract Sum and Contract Time.
   a. Comply with California Code of Regulations, Title 8, Sections 1529, 1532.1 and 5208.

3. Architect assumes no responsibility relating to existence of any hazardous materials, and Architect assumes no responsibility or liability for performance of Work described in the report identified above.

B. Unidentified Hazardous Materials:

1. Except as otherwise specified, in the event that Contractor encounters on the project site material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), or other hazardous materials which have not been rendered harmless, the Contractor shall immediately stop work in the area affected and report the condition to Owner’s Representative.

2. Work in the affected area shall not be resumed except by written agreement between Owner and Contractor if in fact the material is asbestos, PCB, or other hazardous materials and has not been rendered harmless.

3. Work in the affected area shall be resumed in the absence of asbestos, PCB or other hazardous materials, or when such materials have been rendered harmless.

C. Notification and Disclosure: Refer to Contract General Conditions for Asbestos Notification and Disclosure requirements.

1. In the event that hazardous materials are discovered on site during performance of the Work, Contractor shall notify the Owner's Representative and request directions for abatement of hazardous materials.

2. Owner will ensure that the identified hazardous waste and/or hazardous materials are handled and disposed in the manner specified by the State of California Hazardous Substances Control Law (Health and Safety Code Division 20, Chapter 6.5).

1.9 WELDING AND BURNING MITIGATION PROCEDURES

A. Welding and Burning Mitigation Procedures: Eliminate welding and burning of steel as much as possible. Where unavoidable, perform welding and burning with all possible precaution to avoid fire hazard. Provide a fire watch for minimum of 30 minutes after burning stops. Provide protection for all adjacent surfaces.

1.10 EROSION AND SEDIMENT CONTROL PROCEDURES

A. Erosion and Sediment Control Procedures: Refer to runoff control requirements specified in Section 01 57 00 - Temporary Controls. Obtain and comply with Storm Water Pollution Protection Plan (SWPPP) and project specific requirements indicated on Civil Drawings.

1.11 DISPOSAL OPERATIONS PROCEDURES

A. Solid Waste Management:

1. Supply solid waste transfer containers. Clean site of all debris daily; such as spent air filters, oil cartridges, cans, bottles, combustibles and litter. Take care to prevent trash and papers from blowing onto adjacent property. Encourage personnel to use refuse containers. Convey contents to a sanitary landfill at regular intervals. Do not allow transfer containers to remain on-site long enough to cause an unpleasant or noticeable odor.

2. Washing of concrete containers where wastewater may reach adjacent property, storm drains or natural water courses is forbidden. Remove any excess concrete to the sanitary landfill.

B. Chemical Waste and Hazardous Materials Management: furnish containers for storage of spent chemicals used during construction operations. Dispose of chemicals and hazardous materials in accordance with applicable regulations.

C. Garbage: Store garbage in covered containers, empty garbage container contents into the transfer container as necessary, minimum 1/week.

a Provide garbage containers in every area where work is being performed.

D. Grading Spoil and Landscape Debris: Dispose of vegetation, weeds, rubble, and other materials removed by the clearing, stripping and grubbing operations off site at a suitable disposal site in accordance with applicable Federal, State and local Codes, ordinances, statutes and regulations

E. Excavated Materials:

1. Native soil complying with the requirements of applicable specification Sections may be used for backfill, fill and embankments as allowed in applicable by that section.

2. Remove all material which is excavated in excess of that required for backfill. Dispose of unsuitable excavated material from the site and dispose of it legally.
   a. Excess suitable backfill material shall be hauled off site. No additional compensation will be paid to the Contractor for such off haul. Include all such costs in the Contract Sum.
   b. Unsuitable backfill material shall be disposed of off-site in accordance with applicable regulations, in a disposal site indicated in the Environmental Protection Plan.
   c. Remove rubbish and materials unsuitable for backfill immediately following excavation.
   d. Remove material in excess of that required for backfill immediately following backfill operations.

1.12 CULTURAL RESOURCES PROCEDURES

A. Project does not pass through any known archaeological sites. However, it is conceivable that unrecorded archaeological sites could be discovered during construction.

B. In the event that artifacts, human remains, or other cultural resources are discovered during subsurface excavations at locations of the Work, the Contractor shall protect the discovered items, cease work for a distance of 35 feet radius in the area, notify the Architect and Owner Representative and comply with applicable law.

C. Owner may retain an Archaeologist to monitor and recover data and artifacts during period that work has ceased.

D. All items found which are considered to have archaeological significance are the property of the Owner.

1.13 EQUIPMENT REPAIR

A. The work of installing, assembling, repairing or reconditioning, or other work of any nature on machinery, equipment or tools used in or upon the work shall be considered a part of the work to be performed under the contract and any laborers, workers or mechanics working on the machinery, equipment or tools, unless employed by bona fide commercial repair shops, garages, blacksmith shops or machine shops, which have been established and operating on a commercial basis for a period of at least 2 months prior to the award of the contract, shall be subject to all the requirements relating to labor set forth in these specifications and in the special provisions.

PART 2 - PRODUCTS

2.1 PRODUCTS FOR PATCHING, EXTENDING AND MATCHING

A. Provide same products or types of construction as that in existing structure, as needed to patch, extend or match existing.

B. Generally, the Contract Documents will not define products or standards of workmanship present in existing construction; determine products by inspection and necessary testing, and determine quality of workmanship by using existing as a sample for comparison.

C. The presence of a product, finish, or type of construction requires that patching, extending or matching shall be performed as necessary to make work complete and consistent with identical standards of quality.

PART 3 - EXECUTION

3.1 CUTTING AND PATCHING

A. Perform cutting and patching as specified in Section 01 73 29 - Cutting and Patching.

END OF SECTION

SECTION 01 35 23

OWNER SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Procedures for health and safety protection and requirements for reporting accidents.

1.3 SUBMITTALS

A. Accident Reporting: A copy of each accident report, which the Contractor or subcontractors submit to their insurance carriers, shall be forwarded to the Owner's Representative as soon as possible, but in no event later than seven (7) calendar days after the day the accident occurred.

B. Contractor shall submit a copy of its Injury and Illness Prevention Plan (IIPP) adhering to all requirements of Title 8-Cal-OSHA prior to start of construction.

C. Contractor will not be given a Notice to Proceed without approval of a complete IIPP by the Owner.

D. The Contractor's IIPP shall describe the policies it uses to provide a safe and healthy workplace for employees. The IIPP submittal shall include but is not limited to the following required information (per Title 8, CCR 3203):

1. Identification of the person responsible (by name) for implementing the plan.
2. Describe the system used for insuring employee compliance with the plan.
3. Describe the system used for communication health and safety information to employees.
4. Describe the procedure used for correction of unsafe conditions.
5. Describe the procedure used for investigating injuries and illnesses.
6. Describe the procedure used for identifying and evaluating workplace hazards including:
    a. Establishing IIPP program on site
    b. Inspection of the worksite.
    c. Evaluation of new substances, processes, or equipment
    d. Awareness of new or previously unrecognized hazards
7. Describe how safety and health regulations and standards shall be met.
8. Describe type of protective equipment and work procedures to be used.
9. Describe emergency procedures for accidental spills or exposures.
10. Describe methods for hazard detection and air sampling of confined spaces
11. Describe procedures used to safely enter confined spaces

1.4 FACILITIES AND EQUIPMENT

A. Special facilities, devices, equipment, clothing, and similar items used by the Contractor in the execution of the Work shall comply with the applicable regulations.

1.5 HAZARDOUS MATERIALS

A. The Contractor shall bring to the attention of the Owner, any material suspected of being hazardous which he encounters during execution of the Work. The Owner shall perform tests to determine if the material is hazardous. If the material is found hazardous and additional protective measures are needed, a Contract Change Order may be required, subject to the requirements of the General Conditions.

1.6 SMOKING POLICY

A. Smoking and use of Tobacco and/or electronic cigarettes is prohibited within the Park, buildings, grounds, site, and parking lots.

B. Definition: Smoking means inhaling, exhaling, burning and carrying a lighted cigarette, cigar, pipe, or other smoking/vaping apparatus.

C. The Owner regulations are intended to mitigate exposure to secondhand smoke.

1. Smoking is prohibited in all Owner buildings (including facilities under construction) and leased space (including space within buildings shared with others). This prohibition shall apply to any area enclosed by the perimeter (outermost) walls of the building, including restrooms, warehouse and storage space. Atriums, balconies, stairwells, and other similar building features are to be considered "within a building."
2. Smoking is prohibited in Owner-owned vehicles. This prohibition includes passenger vehicles and all other state-owned mobile equipment, including light and heavy-duty trucks, cargo and passenger vans, buses, and any other mobile equipment with an enclosed or enclosable driver/passenger compartment.
3. Smoking is prohibited within 25 feet of doorways/buildings.
4. Smoking is prohibited throughout the Park.
5. Specific outside areas for smoking will not be established or identified.
6. The Contractor will clearly display signs at the entrances/exits and other appropriate locations throughout the construction site to notify workers and the public that smoking is prohibited within the work site.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 STOP WORK ORDERS

A. When the Contractor or its subcontractors are notified by the Owner’s Representative of an incident of noncompliance with the provisions of the Contract, and the action(s) to be taken, the Contractor shall immediately, if so directed, or within 48 hours after receipt of a notice of violation, correct the unsafe or unhealthy condition.

B. If the Contractor fails to comply promptly, all or any part of the work performed may be stopped by with a "Stop Work Order." When, in the opinion of the Owner’s Representative, satisfactory corrective action has been taken to correct the unsafe and unhealthy condition, a start order will be given immediately.

C. The Contractor shall not be allowed any extension of time or compensation for damages by reason of or in connection with such work stoppage.

3.2 PROTECTION

A. Contractor shall take all necessary precautions to prevent injury to the public, building occupants, or damage to property of others. For the purposes of the Contract, the public or building occupants shall include all persons not employed by the Contractor or a subcontractor working under the Contractor's direction.

B. Work shall not be performed in any area occupied by the public or Owner's employees unless specifically permitted by the Contract or the Owner and unless adequate steps are taken for the protection of the public and the Owner's employees.

C. Whenever practicable, the work area shall be fenced, barricaded, or otherwise blocked off from the public or park occupants to prevent unauthorized entry into the work area.

D. Alternate Precautions: When the nature of the Work prevents isolation of the work area, and the public or park occupants may be in or pass through, under or over the work area, alternate precautions such as the posting of signs, the use of signal persons, the erection of barricades or similar protection around particularly hazardous operations shall be used as appropriate.

E. Public Thoroughfare: When Work is to be performed over a public thoroughfare such as a sidewalk, the thoroughfare shall be closed, if possible, or other precautions taken such as the installation of screens or barricades. When the exposure to heavy falling objects exists, as during tree removal, special protection shall be provided for in the work plan for that activity.

F. Fences and barricades shall be removed upon completion of the project to the satisfaction of the Owner.

G. Storing, positioning or use of equipment, tools, materials, scraps, and trash in a manner likely to present a hazard to the public or park occupants by its accidental shifting, ignition, or other hazardous qualities is prohibited.

3.3 TRENCHING

The following shall apply to digging trenches or other excavations that extend deeper than four feet (4') below the surface:

A. The Contractor shall promptly, and before the following conditions are disturbed, notify the Engineer, in writing, of any:
   1. 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, II, or III disposal site in accordance with provisions of existing law.
   2. Subsurface or latent physical conditions at the site differing from those indicated.
   3. Unknown physical conditions at the site of any unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract.

B. The Engineer shall promptly investigate the conditions, and if he finds that the conditions do materially 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, excluding loss of anticipated profits, under the procedures described in the contract. No contract adjustment that results in a benefit to the Contractor will be allowed unless the Contractor has provided the required written notice.

C. 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 that pertain to the resolution of disputes and protests between the contracting parties.

D. In the event conditions materially differ from those indicated, the Contractor shall have no claim for construction delays, unless said conditions are determined by the Engineer to impact the controlling item of work.

E. Where a trench deeper than three (3) feet is required within fifteen (15) feet of an existing adobe brick structure, install trench shoring continuous along the length of that structure and extending five (5) feet beyond that structure in each direction.

END OF SECTION

SECTION 01 35 53

SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Contractor Security requirements.

1.3 SECURITY (Also refer to Contract General Conditions)

A. Protect the Work from theft, vandalism and unauthorized entry. Contractor holds sole responsibility for job site security.

B. Maintain security throughout construction until the Owner's occupancy or acceptance.

C. Provide keying different from permanent keying of locks and include organized, locked and supervised storage for receiving and dispensing finished materials throughout the construction.

D. Provide the Owner with keys necessary to gain access to locked areas of the Work. The Owner will be responsible for such keys and will return them to the Contractor upon acceptance of the project or area as complete.

1.4 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into project site.
B. Allow site entrance only to authorized persons with proper identification.

1.5 PERMANENT KEYS

A. Immediately upon receipt of permanent keys for whatever purpose (finish hardware, mechanical equipment, casework, dispensers, lockers, switches, equipment items, etc.), tag or otherwise clearly identify keys according to one approved system and turn them over to the Owner prior to any opportunity of access to keys by parties other than the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes: Certain Codes and Standards and relevant requirements applicable to the Work required under this Contract.

1.3 AUTHORITY AND PRECEDENCE OF CODES, ORDINANCES AND STANDARDS

A. Authority: All codes, ordinances and standards referenced in the Drawings and Specifications shall have the full force and effect as though printed in their entirety in the Specifications.

B. Precedence:

1. Where specified requirements differ from the requirements of applicable codes, ordinances and standards, the more stringent requirements shall take precedence.

2. Where the Drawings or Specifications require or describe products or execution of better quality, higher standard or greater size than required by applicable codes, ordinances and standards, the Drawings and Specifications shall take precedence so long as such increase is legal.

3. Where no requirements are identified in the Drawings or Specifications, comply with all requirements of applicable codes, ordinances and standards of authorities having jurisdiction.

1.4 STATUTORY AND JURISDICTIONAL REGULATIONS

A. Perform the Work in accordance with Applicable Code Requirements and applicable requirements of all other regulatory agencies including, but not limited to, the following:

1. State of California Code of Regulations (CCR), Title 24 State Building Standards, 2013.
2. California State Fire Marshall.
3. Local City Fire Department - Public Assembly Unit *(based on project location)*.
4. Owner Designated Plan Check Authority (P.C. Associates).
5. Owner Designated Seismic Peer Review Authority.

B. Performance of the Work shall also comply with applicable requirements of California Code of Regulations (CCR) as follows:

1. Title 19 - Public Safety.
2. Title 22 - Social Security.

C. Unless otherwise specified, specific references to codes, regulations, standards, manufacturers' instructions, or requirements of regulatory agencies, when used to specify requirements for materials or design elements, shall mean the edition of each in effect as identified in the Contract Documents.

D. Contractor shall maintain copies of regulatory reference manuals and code books on the job site for reference during planning, submittal processing and field installation of specific work.

E. Contractor and each subcontractor or supplier engaged in construction of the project shall be thoroughly familiar with the codes and regulations applicable to their specific construction activities. Contractor's responsibility for familiarity with applicable codes and regulations shall extend to the entire scope of work specified in the Contract Documents.

1.5 CONFLICTS

1.5.1 Unless otherwise directed by the Architect, if a conflict exists between referenced regulatory requirements, comply with the one establishing more stringent requirements.

1.5.2 Unless otherwise directed by the Architect, if a conflict exists between referenced regulatory requirements and the Contract Documents, comply with the more stringent requirements.

1.5.3 Submittals

1.5.3.1 Submit to the Owner Representative copies of all permits, licenses, certifications, inspection reports, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records and other documentation established and/or required in conjunction with compliance with specified standards and regulations. Maintain copies of the aforementioned documents at the project site at all times.

2 PRODUCTS (Not Used)

3 EXECUTION (Not Used)

END OF SECTION

SECTION 01 42 00

REFERENCE STANDARDS AND ABBREVIATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Use of references in Drawings and Specifications, including requirements for copies of reference standards at Project site.

B. Definitions of terms used in Specifications and Drawings, including abbreviations, acronyms, names and terms which may be used in Specifications.

1.3 RELATED SECTIONS

A. Section 01 41 00 - Regulatory Requirements: Identification of applicable building Code and other codes, ordinances and regulations applicable to performance of the Work.

1.4 USE OF REFERENCES

A. References: The Drawings and Specifications contain references to various standards, standard specifications, codes, practices and requirements for products, execution, tests and inspections. These reference standards are published and issued by the agencies, associations, organizations and societies listed in this Section or identified in individual product specification Sections.

1. Wherever term "Agency" occurs in Specifications, it shall be understood to mean the term used for Owner for purposes of the Contract.

2. Wherever term "Engineer" occurs in Specifications, it shall be understood to mean Architect or other responsible design professional for purposes of the Contract.

3. Where reference is made to Standard Details, such reference shall be to the Standard Details included in the Construction Drawings and listed as “County/City/Etc. Standard Details”

B. Relationship to Drawings and Specifications: Such references are incorporated into and made a part of the Drawings and Specifications to the extent applicable.

C. Referenced Grades Classes and Types: Where an alternative or optional grade, class or type of product or execution is included in a reference but is not identified on the Drawings or in the Specifications, provide the highest, best and greatest of the alternatives or options for the intended use and prevailing conditions.

D. Copies of Reference Standards:

1. Reference standards are not furnished with the Drawings and Specifications because it is presumed that the Contractor, subcontractors, manufacturers, suppliers, trades and crafts are familiar with these generally recognized standards of the construction industry.

2. Copies of reference standards may be obtained from publishing sources.

E. Jobsite Copies:

1. Contractor shall obtain and maintain at the Project site copies of reference standards identified on the Drawings and in the Specifications in order to properly execute the Work.

2. At a minimum, the following shall be readily available at the site (electronically or in print), as applicable to the Work:
   a. State Building Codes: As referenced in Section 01 41 00 - Regulatory Requirements.
   b. Safety Codes: Occupational Safety and Health Act (OSHA) regulations and State of California, California Administrative Code, California Code of Regulations (CCR), Title 8 - Industrial Relations, Chapter 4, Subchapter 7, General Industry Safety Orders (Cal-OSHA), to extent applicable to the Work.
   c. General Standards:
      1) CCR Title 24, Part 2, Volume 3: 2013 California Building Code (CBC) Material, Testing and Installation Standards.
      2) CCR Title 24, Part 12: 2001 California Referenced Standards Code.
      3) Underwriters Laboratories, Inc. (UL) Building Products Listing.
      4) Factory Mutual Research Organization (FM) Approval Guide.
      5) American Society for Testing and Materials (ASTM) Standards in Building Codes. 6) American National Standards Institute (ANSI) standards.
   d. Fire and Life Safety Standards: All referenced standards pertaining to fire rated construction and exiting.
   e. Common Materials Standards: American Concrete Institute (ACI), American Institute of Steel Construction (AISC), American Welding Society (AWS), Gypsum Association (GA), National Fire Protection Association (NFPA), Tile Council of America (TCA) and Woodwork Institute of California (WIC) standards to the extent referenced within the Contract Specifications.
   f. Research Reports: ICC Evaluation Service, Inc. (ICC-ES), formerly ICBO Evaluation Service, Inc. (ICBO ES) Research Reports and National Evaluation Service, Inc. Reports (NER), for products not in conformance to prescribed requirements stated in California Building Code (CBC).
   g. Product Listings: Approval documentation, indicating approval of authorities having jurisdiction for use of product within the applicable jurisdiction.

F. Edition Date of References:

1. When an edition or effective date of a reference is not given, it shall be understood to be the current edition or latest revision published as of the date of the Contract Drawings and Contract Specifications.

2. All amendments, changes, errata and supplements as of the effective date shall be included.

G. ASTM and ANSI References: Specifications and Standards of the American Society for Testing and Materials (ASTM) and the American National Standards Institute (ANSI) are identified in the Drawings and Specifications by abbreviation and number only and may not be further identified by title, date, revision or

amendment. It is presumed that the Contractor is familiar with and has access to these nationally- and industry-recognized specifications and standards.

1.5 DEFINITIONS OF TERMS

A. Basic Contract Definitions: Words and terms governing the Work are defined in the Contract General and Supplementary Conditions, as referenced in the Agreement.

B. Words and Terms Used on Drawings and in Specifications: Additional words and terms may be used in the Drawings and Specifications and are defined as follows:

1. "Applicable”: As appropriate for the particular condition, circumstance or situation.

2. "Approve(d)": Approval action shall be limited to the duties and responsibilities of the party giving approval, as stated in the Conditions of the Contract. Approvals shall be valid only if obtained in writing and shall not apply to matters regarding the means, methods, techniques, sequences and procedures of construction. Approval shall not relieve the Contractor from responsibility to fulfill Contract requirements.

3. "And/or”: If used, shall mean that either or both of the items so joined are required.

4. "Directed”: Limited to duties and responsibilities of the Owner’s Representative or Architect as stated in the Contract General Conditions, meaning "as instructed by the Owner’s Representative or Architect, in writing, regarding matters other than the means, methods, techniques, sequences and procedures of construction. Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean "directed by the Owner’s Representative or Architect", "requested by the Owner’s Representative or Architect", and similar phrases. No implied meaning shall be interpreted to extend the responsibility of the Owner’s Representative, Architect or other responsible design professional into the Contractor's supervision of construction.

5. "Equal" or "Equivalent": As determined by Architect or other responsible design professional as being equivalent, considering such attributes as durability, finish, function, suitability, quality, utility, performance and aesthetic features.

6. "Furnish": Means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."

7. "Indicated": The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as "shown", "noted", "scheduled", and "specified" are used to help the reader locate the reference. There is no limitation on location.

8. "Install": Describes operations at the Project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.

9. "Installer"
   a. "Installer": refers to the Contractor or an entity engaged by the Contractor, such as an employee, subcontractor, or sub-subcontractor for performance of a particular construction activity, including installation, erection, application and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

b. "Experienced Installer": The term "experienced," when used with "installer" means having a minimum of 5 previous Projects similar in size to this Project, knowing the precautions necessary to perform the Work, and being familiar with requirements of authorities having jurisdiction over the Work.

10. "Jobsite": Same as site.

11. "Necessary": With due considerations of the conditions of the Project and as determined in the professional judgment of the Architect or other responsible design professional as being necessary for performance of the Work in conformance with the requirements of the Contract Documents, but excluding matters regarding the means, methods, techniques, sequences and procedures of construction.

12. "Noted": Same as "Indicated."

13. "Per": Same as "in accordance with," "according to" or "in compliance with."

14. "Products": Material, system or equipment.

15. "Project Site": Same as "Site."

16. "Proper": As determined by the Architect or other responsible design professional as being proper for the Work, excluding matters regarding the means, methods, techniques, sequences and procedures of construction, which are solely the Contractor's responsibility to determine.

17. "Provide": Means "furnish and install, complete and ready for the intended use."

18. "Public Contract Code," refers to "California Code Public Contract Code – PCC DIVISION 2 - GENERAL PROVISIONS PART 3 - CONTRACTING BY LOCAL AGENCIES"

19. "Regulation": Includes laws, ordinances, statutes and lawful orders issued by authorities having jurisdiction, as well as and rules, conventions and agreements within the construction industry that control performance of the Work.

20. "Required": Necessary for performance of the Work in conformance with the requirements of the Contract Documents, excluding matters regarding the means, methods, techniques, sequences and procedures of construction, such as:

a. Regulatory requirements of authorities having jurisdiction.
b. Requirements of referenced standards.
c. Requirements generally recognized as accepted construction practices of the locale.
d. Notes, schedules and graphic representations on the Drawings.
e. Requirements specified or referenced in the Specifications.
f. Duties and responsibilities stated in the Bidding and Contract Requirements.

21. "Schedule of Values," refers to a cost-loaded, itemized accounting of the cost of each individual scope of work. The schedule of values reflects the actual cost of work, and each line item will determine the amount to be credited back to the owner in the even that a scope of work is removed from the contract. The schedule of values is discussed in detail in Section 01 32 00 – Construction Progress Documentation.

20. "Scheduled": Same as "Indicated."

21. "Selected": As selected by the Owner's Representative, Architect or other responsible design professional from the full selection of the manufacturer's products, unless specifically limited in the Contract Documents to a particular quality, color, and texture or price range.

22. "Shown": Same as "Indicated."

23. "Site": Same as "Site of the Work" or "Project Site;" the area or areas or spaces occupied by the Project and including adjacent areas and other related areas occupied or used by the Contractor for construction activities, either exclusively or with others performing other construction on the Project. The extent of the Project Site is shown on the Drawings, and may or may not be identical with the description of the land upon which the Project is to be built.

24. "Supply": See "Furnish."

25. "Testing Laboratory" or "Testing Laboratories": An independent entity engaged to perform specific inspections or tests, at the Project Site or elsewhere, and to report on, and, if required, to interpret, results of those inspections or tests. Refer to Section 01458 - Testing Laboratory Services.

26. "Testing and Inspection Agency": Same as "Testing Laboratory."

1.6 ABBREVIATIONS, ACRONYMS, NAMES AND TERMS, GENERAL

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(202) 862-5100
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists (The) www.aatcc.org	(919) 549-8141
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	ACI International (American Concrete Institute) www.aci-int.org	(248) 848-3700

ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AFPA	American Forest & Paper Association (See AF&PA)	
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHA	American Hardboard Association (Now part of CPA)	
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America www.alca.org	(800) 395-2522 (703) 736-9666
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150

ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts www.aosaseed.com	(505) 522-1437
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (212) 591-7722
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWCI	AWCI International (Association of the Wall and Ceiling Industries International) www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (See WCSC)	
AWI	Architectural Woodwork Institute	(800) 449-8811

	www.awinet.org	(703) 733-0600
AWPA	American Wood-Preservers' Association www.awpa.com	(334) 874-9800
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI www.bicsi.org	(813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
CCC	Carpet Cushion Council www.carpetcushion.org	(203) 637-1312
CCFSS	Center for Cold-Formed Steel Structures www.umr.edu/~ccfss	(573) 341-4471
CDA	Copper Development Association Inc. www.copper.org	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association www.canelect.ca	(613) 230-9263
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CGSB	Canadian General Standards Board www.pwgsc.gc.ca/cgsb	(800) 665-2472 (819) 956-0425
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462

CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CPA	Composite Panel Association www.pbmdf.com	(301) 670-0604
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772 (202) 462-9607
CRI	Carpet & Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(800) 463-6727 (416) 747-4000
CSI	Cast Stone Institute 10 West Kimball St. Winder, GA 30680-2535	(770) 868-5909
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee www.asce.org	(800) 548-2723 (703) 295-6300

EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association	(315) 339-6937
FCI	Fluid Controls Institute www.fluidcontrolsinstitute.org	(216) 241-7333
FIBA	Federation Internationale de Basketball Amateur (The International Basketball Federation) www.fiba.com	41 22 545 00 00
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation) www.fivb.ch	41 21 345 35 35
FM	Factory Mutual System (See FMG)	
FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmglobal.com	(401) 275-3000
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridaroof.com	(407) 671-3772
FSA	Fluid Sealing Association	(610) 971-4850 www.fluidsealing.com
FSC	Forest Stewardship Council	52 951 5146905 www.fscoax.org
GA	Gypsum Association	(202) 289-5440 www.gypsum.org
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GRI	Geosynthetic Research Institute (See GSI)	
GS	Green Seal www.greenseal.org	(202) 872-6400
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HI	Hydraulic Institute	(888) 786-7744

	www.pumps.org	(973) 267-9700
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (See NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAS	International Approval Services (See CSA)	
IBF	International Badminton Federation www.intbadfed.org	(441-24) 223-4904
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance (The) www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(702) 567-8150
ITS	Intertek	(800) 345-3851

	www.intertek.com	(607) 753-6711
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LMA	Laminating Materials Association www.lma.org	(201) 664-2700
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864 (847) 577-7200
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MFMA	Maple Flooring Manufacturers Association www.maplefloor.org	(847) 480-9138
MFMA	Metal Framing Manufacturers Association www.metalframingmfg.org	(312) 644-6610
MH	Material Handling Industry of America (See MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926

NAGWS	National Association for Girls and Women in Sport www.aahperd.org/nagws/	(800)213-7193 x453
NAIMA	North American Insulation Manufacturers Association (The) www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCAA	National Collegiate Athletic Association (The) www.ncaa.org	(317) 917-6222
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-3550
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(303) 697-8441
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	NFPA www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818

NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	National Oak Flooring Manufacturers Association www.nofma.org	(901) 526-5016
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. www.ntma.com	(800) 323-9736 (540) 751-0930
NTRMA	National Tile Roofing Manufacturers Association (See RTI)	
NWWDA	National Wood Window and Door Association (See WDMA)	
OPL	Omega Point Laboratories, Inc. www.opl.com	(800) 966-5253 (210) 635-8100
PCI	Precast/ Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute www.pgi-tp.ce.uiuc.edu	(217) 333-3929
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540
RCSC	Research Council on Structural Connections (800) 644-2400 www.boltcouncil.org (312) 670-2400	

RFCI	Resilient Floor Covering Institute (301) 340-8580 www.rfci.com	
RIS	Redwood Inspection Service (888) 225-7339 www.calredwood.org	(415) 382-0662
RTI	Roof Tile Institute (Formerly: NTRMA - National Tile Roofing Manufacturers Association) www.ntrma.org	(312) 670-4177
SAE	SAE International www.sae.org	(724) 776-4841
SDI	Steel Deck Institute www.sdi.org	(847) 462-1930
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(516) 294-5424
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(703) 683-2075
SIGMA	Sealed Insulating Glass Manufacturers Association (See IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SMPTE	Society of Motion Picture and Television Engineers www.smpte.org	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The)	(850) 434-2611

	www.spib.org	
SPI/SPFD	Society of the Plastics Industry, Inc. (The) Spray Polyurethane Foam Division (See SPFA)	
SPRI	SPRI (Single Ply Roofing Institute) www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWRI	Sealant, Waterproofing, & Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute, Inc. www.tpinst.org	(608) 833-5900
TPI	Turfgrass Producers International www.turfgrasssod.org	(800) 405-8873 (847) 705-9898
UL	Underwriters Laboratories Inc. www.ul.com	(800) 285-4476 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USAV	USA Volleyball www.usavolleyball.org	(888) 786-5539 (719) 228-6800
USGBC	U.S. Green Building Council www.usgbc.org	(202) 828-7422

USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association (See WCSC)	
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association) www.windowcoverings.org	(800) 506-4636 (212) 661-4261
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WI	Woodwork Institute (Formerly: WIC – Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WIC	Woodwork Institute of California (See WI)	
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 548-0112
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

A. Abbreviations, General: The following are commonly-used abbreviations which may be found on the Drawings or in the Specifications:

AC or ac	Alternating current or air conditioning (depending upon context)
AMP or amp	Ampere
C	Celsius
CFM or cfm	Cubic feet per minute
CM or cm	Centimeter
CY or cy	Cubic yard
DC or dc	Direct current
DEG or deg	Degrees
F	Fahrenheit
FPM or fpm	Feet per minute

FPS or fps	Feet per second
FT or ft	Foot or feet
Gal or gal	Gallons
GPM or gpm	Gallons per minute
IN or in	Inch or inches
Kip or kip	Thousand pounds
KSI or ksi	Thousand pounds per square inch
KSF or ksf	Thousand pounds per square foot
KV or kv	Kilovolt
KVA or kva	Kilovolt amperes
KW or kw	Kilowatt
KWH or kwh	Kilowatt hour
LBF or lbf	Pounds force
LF or lf	Lineal foot
M or m	Meter
MPH or mph	Miles per hour
MM or mm	Millimeter
PCF or pcf	Pounds per cubic foot
PSF or psf	Pounds per square foot
PSI or psi	Pounds per square inch
PSY or psy	Per square yard
SF or sf	Square foot
SY or sy	Square yard
V or v	Volts

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

ADAAG	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.access.gpo.gov/nara/cfr	(888) 293-6498 (202) 512-1530
CRD	Handbook for Concrete and Cement Available from Army Corps of Engineers Waterways Experiment Station www.wes.army.mil	(601) 634-2355
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point www.dodssp.daps.mil	(215) 697-6257

C. Undefined Abbreviations, Acronyms, Names and Terms: Words and terms not otherwise specifically defined in this Section, in the Instructions to Bidders, in the Contract General Conditions, on the Drawings or elsewhere

in the Specifications, shall be as customarily defined by trade or industry practice, by reference standard and by specialty dictionaries such as the following:

1. Dictionary of Architecture and Construction, Fourth Edition (Cyril M. Harris, McGraw-Hill Book Company, 2006).

2. The American Institute of Architects (AIA) Document M101, "Glossary of Construction Industry Terms."

3. Encyclopedia of Associations, published by Gale Research Co., commonly available in public libraries.

PART 2 - PRODUCTS

Not Applicable to this Section.

PART 3 - EXECUTION

Not Applicable to this Section.

END OF SECTION

SECTION 01 43 39

MOCK-UPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Full scale mock-ups for visual qualities.

1.3 RELATED SECTIONS

A. Section 03 33 00 – Architectural Concrete

B. Section 05 55 00 – Metal Fabrications

C. Section 06 10 63 – Exterior Carpentry

D. Section 32 14 41 – Sand-Set Flagstone Paving

1.4 DEFINITIONS

A. Mock-Ups: Full-size, physical example assemblies to illustrate finishes and materials.

1. Mock-ups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples.

2. Mock-ups establish the standard by which the Work will be judged.

1.5 SUBMITTALS

A. Product Data and Shop Drawings: For each product or system that will be incorporated in the mock-ups, submit required submittals electronically as specified in submittal section and applicable product section of the Specifications.

1.6 QUALITY ASSURANCE

A. Mock-Ups: Before installing portions of the Work requiring mock-ups, build mock-ups for each form of con struction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mock-ups in location and of size indicated or, if not indicated, as directed by Owner’s Representative.

2. Notify Owner's Representative and Architect minimum of seven days in advance of dates and times when mock-ups will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Obtain review and acceptance of mock-ups by Architect and Owner's Representative before starting Work, including fabrication and installation construction.

5. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Demolish and remove mock-ups when directed, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MOCK-UPS FOR VISUAL QUALITIES

A. Mock-Ups for Visual Qualities: Before installing portions of the Work requiring a mock-up, build the mock-ups with each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Construct field mock-ups as indicated on the Drawings, indicating assemblies and interfaces of materials.

2. Construct mock-ups at location where directed by Owner's Representative.

3. Demonstrate the proposed range of visual effects, qualities and workmanship.

4. Provide structural substrate for mock-ups as suitable. Mock-ups shall be free standing and self-supporting.

5. Maintain mock-ups during construction in an undisturbed condition as a standard for judging completed Work.

6. Demolish and legally dispose of mock-ups when directed, unless otherwise indicated.

PART 3 - EXECUTION

3.1 CONSTRUCTION OF MOCK-UPS FOR VISUAL QUALITIES

A. Mock-Ups for Visual Qualities, General: Construct mock-ups as noted on the Drawings and specified in individual product Sections of the Specifications.

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Definitions

B. Responsibilities

C. Inspections

D. Submittals

E. Regulatory requirements for testing and inspection.

F. Contractor's quality control.

G. Quality of the Work.

H. Inspections and tests by authorities having jurisdiction.

I. Inspections and tests by serving utilities.

J. Inspections and tests by manufacturer's representatives.

1.3 RELATED SECTIONS

A. Section 01 31 13 - Coordination: Coordination of Work under Contract.

B. Section 01 41 00 - Regulatory Requirements: Compliance with applicable codes, ordinances and standards.

C. Section 01 45 29 - Testing Laboratory Services: Selection of independent testing and inspection laboratory; tests and inspections conducted by testing laboratory.

D. Section 01 60 00 - Product Requirements: Product options, substitutions, transportation and handling requirements, storage and protection requirements, and system completeness requirements.

1.4 DEFINITIONS

A. Quality control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Owner Representative or Architect.

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

1. Specific quality control requirements for individual activities are specified in Sections relative to those activities.

2. Specified inspections, tests, and related actions do not limit Contractor's quality control procedures that facilitate compliance with Contract Document Requirements.

3. Requirements for Contractor to provide quality control services required by Owner Representative, Architect, or authorities having jurisdiction are not limited by provisions of this Section.

0.5 RESPONSIBILITIES

A. General: Comply with requirements of Contract General Conditions.

B. Unless otherwise indicated as the responsibility of another identified entity, Owner will employ and pay for services of independent testing laboratory to perform inspections, tests, and other quality control services specified elsewhere in Contract Documents and required by authorities having jurisdiction.

C. Where individual Sections specifically indicate that certain inspections, tests, and other quality control services are Contractor's responsibility, Contractor shall employ and pay qualified independent testing agency to perform quality control services. Costs for these services are included in Contract Sum.

a. Where the Owner has engaged a testing agency for testing and inspecting parthe t of Work, and Contractor is also required to engage entity for same or related the element, Contractor shall not employ entity engaged by Owner, unless agreed to in writing by Owner.

C. Retesting: Contractor is responsible for retesting where results of inspections, tests, or other quality control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether original test was Contractor's responsibility.

a Cost of retesting Work, revised or replaced by Contractor, is Contractor's responsibility where required tests performed on original Work indicated noncompliance with Contract Document requirements.

D. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:

a. Provide access to Work.

b. Furnish incidental labor and facilities necessary to facilitate inspections and tests.

c. Assist Owner as requested in taking quantities of representative samples of materials that require testing or assist testing agency in taking samples.

d. Provide facilities for storage and curing of test samples.

e. Provide security and protection of samples and test equipment at Project Site.

E. Duties of Testing Agency: Independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with Owner Representative, Architect, and Contractor in performance of agency's duties. Testing agency shall provide qualified per sonnel to perform required inspections and tests.

1. Agency shall notify Owner Representative, Architect, and Contractor promptly of irregularities or deficiencies observed in Work during performance of its services.

2. Agency is not authorized to release, revoke, modify, alter, interpret, or expand requirements of Contract Documents or approve or accept any portion of Work.

3. Agency shall not perform any duties of Contractor.

1.6 INSPECTIONS

A. General: All construction work shall be subject to inspection by the Owner and the Architect, and all such construction or work shall remain accessible and exposed for inspection purposes until approved by the Owner.

1. The Owner will provide project personnel, including specialty inspectors, to be available at the project site.

1 The Owner does not employ or control city, county, fire, or other municipal inspectors.

2. Approval as a result of an inspection shall not be construed to be an approval of any violation of the provisions of the building code or of other ordinances of the California State Building Code or other regulations of Agencies having jurisdiction over this project, including plans and specifications. Inspections presuming to give authority to violate or cancel the provisions of code or contract documents shall not be valid.

3. It shall be the duty of the contractor to cause the work to remain accessible and exposed for inspection purposes. Neither the Inspector, Owner, nor Architect shall be liable for expense entailed in the removal or replacement of any material required to allow inspection.

B. Inspection Requests: It shall be the duty of Contractor to notify the Inspector that specific work is ready for inspection. The Owner requires that every request for inspection be filed at least two working days (48 hours) before such inspection is desired. Such requests shall be submitted in writing, using the inspection request form included at the end of this section. Confirm with Authorities Having Jurisdiction their requirements for minimum inspection request lead times.

C. Approval Required: Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the Inspector. The Inspector, upon notification, shall make the requested inspections and shall either indicate in writing that a specific portion of the construction is satisfactory as completed, or shall notify the Contractor that same fails to comply with plans and specifications. Any portions which do not comply shall be corrected by the Contractor prior to the end of the workday, or a Deficiency Notice will be issued by the Inspector, placing the Contractor on notice that the work does not conform to the requirements of the Contract Documents. Such portion of Work shall not be covered or concealed until authorized by the Inspector.

1. There shall be a final inspection and approval of all work when completed and ready for occupancy and use.

D. Inspection Coordination: Contractor shall provide, on a weekly basis, an anticipated Inspection Requirements Schedule, coordinated with the three-week look ahead schedule. The Inspection Requirements Schedule shall show the anticipated inspection needs for the following three weeks to facilitate appropriate Park coordination, as well as mobilization of required inspection staffing.

E. Required Inspections: Reinforcing steel, structural framework or interior wall and/or ceiling support framing of any part of any building or structure shall not be covered or concealed without first obtaining the approval of the Inspector.

1. Listed below are the minimum inspection requirements:

a. Inspections as defined in each Specification Section.

b. Punchlist Inspection – As defined in General Conditions. Performed after the contractor has completed their own inspection and completion of any rework or punchlist items.

c. Final Inspection: To be made when the work is completed and ready for occupancy.

d. Other Inspections as required by the AHJ: In addition to the inspections specified above, the inspector may make or require other inspections of any construction work to ascertain compliance with the provisions of the plans and specifications.

e. Reinspections: A reinspection fee may be assessed for each inspection or reinspection when such portion of work for which inspection is called is not complete, or when corrections called for are not made.

2. The Contractor is responsible for reviewing all of the Contract Documents for any additional inspection requirements.

1.7 SUBMITTALS

A. Reports:

1. Where Owner are responsible for service, independent testing agency shall submit certified reports electronically (or in writing if necessary), of each inspection, test, or similar service to Owner Representative and Architect.

2. If Contractor is responsible for service, independent testing agency shall submit certified report electronically (or in writing if necessary) of each inspection, test, or similar service through Contractor for distribution as noted above.

3. Submit additional copies of each written report directly to governing authority when authority so directs.

B. Report Data: Provide reports electronically of each inspection, test, or similar service including, but not limited to the following:

1. Date of issue.

2. Project title and number.

3. Name, address, and telephone number of testing agency.

4. Dates and locations of samples and tests or inspections.

5. Names of individuals making inspection or test.

6. Designation of Work and test method.

7. Identification of Specification Section.

8. Complete inspection or test data.

9. Test results and interpretation of test results.

10. Ambient conditions at time of sample taking and testing.

11. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.

12. Name and signature of laboratory inspector.

13. Recommendations on retesting.

1.8 REGULATORY REQUIREMENTS FOR TESTING AND INSPECTION

A. Building Code Requirements: Comply with requirements for testing and inspections in the California Building Code (CBC), as interpreted by authorities having jurisdiction. Additional requirements for testing and inspection, as adopted by authorities having jurisdiction, shall be included in the Contract Sum and Contract Time.

B. Requirements of Fire Regulations: Comply with testing and inspection requirements of the Fire Marshal having jurisdiction. All tests and inspections shall be included in Contract Sum and Contract Time.

1.9 CONTRACTOR'S QUALITY CONTROL

A. Contractor's Quality Control: Contractor shall ensure that products, services, workmanship and site conditions comply with requirements of the Drawings and Specifications by coordinating, supervising, testing and inspecting the Work and by utilizing only suitably qualified personnel.

B. Quality Requirements: Work shall be accomplished in accordance with quality requirements of the Drawings and Specifications, including, by reference, all Codes, laws, rules, regulations and standards. When no quality basis is prescribed, the quality shall be in accordance with the best accepted practices of the construction industry for the locale of the Project, for projects of this type.

C. Quality Control Personnel: Contractor shall employ and assign knowledgeable and skilled personnel as necessary to perform quality control functions to ensure that the Work is provided as required.

D. Coordination of Field Quality Control: Contractor shall coordinate and schedule field quality control activities of Owner’s independent testing and inspection agency and inspectors from authorities having jurisdiction.

1.10 QUALITY OF THE WORK

A. Quality of Products: Unless otherwise indicated or specified, all products shall be new, free of defects and fit for the intended use.

B. Quality of Installation: All Work shall be produced plumb, level, square and true, or true to indicated angle, and with proper alignment and relationship between the various elements.

C. Protection of Existing and Completed Work: Take all measures necessary to preserve and protect existing and completed Work free from damage, deterioration, soiling and staining, until Acceptance by the Owner.

D. Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Unless more stringent requirements are indicated or specified, comply with manufacturer's instructions and recommendations, reference standards and building code research report requirements in preparing, fabricating, erecting, installing, applying, connecting and finishing Work.

E. Deviations from Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Document and explain all deviations from reference standards and building code research report requirements and manufacturer's product installation instructions and recommendations, including acknowledgement by the manufacturer that such deviations are acceptable and appropriate for the Project.

F. Verification of Quality: Work shall be subject to verification of quality by Owner or Architect in accordance with provisions of the Contract General Conditions.

1. Contractor shall cooperate by making Work available for inspections and observations by Owner’s Representative, Architect and their consultants.

2. Such verification may include mill, plant, shop, or field inspection, as required.

3. Provide access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated.

4. Provide all information and assistance as necessary, including that from subcontractors, fabricators, materials suppliers and manufacturers, for verification of quality by Owner’s Representative or Architect.

5. Contract modifications, if any, resulting from such verification activities shall be governed by applicable provisions in the Contract General Conditions.

G. Observations by Architect and Architect's Consultants: Periodic and occasional observations of Work in progress will be made by Architect and Architect's consultants as deemed necessary to review progress of Work and general conformance with the design intent.

H. Limitations on Inspection, Test and Observations: Employment of an independent testing and inspection agency and observations by Architect and Architect's consultants shall not relieve Contractor of the obligation to perform Work in full conformance to all requirements of Contract Documents and applicable Building Code and other regulatory requirements.

I. Rejection of Work: The Owner reserves the right to reject any and all Work not in conformance to the requirements of the Contract Documents.

J. Correction of Non-Conforming Work: Non-conforming Work shall be modified, replaced, repaired or redone by the Contractor at no change in Contract Sum or Contract Time.

K. Acceptance of Non-Conforming Work: Acceptance of non-conforming Work, without specific written acknowledgement and approval of the Owner's Representative, shall not relieve the Contractor of the obligation to correct such Work.

L. Contract Adjustment for Non-conforming Work: Should Owner's Representative determine that it is not feasible or not in Owner's interest to require non-conforming Work to be repaired or replaced, an equitable reduction in Contract Sum shall be made by agreement between Owner's Representative and Contractor. If an equitable amount cannot be agreed upon, a Field Instruction will be issued and the amount in dispute resolved in accordance with applicable provisions of the Contract General Conditions.

M. Non-Responsibility for Non-Conforming Work: Architect and Architect's consultants disclaim any and all responsibility for Work produced that is not in conformance with the Contract Drawings and Contract Specifications.

1.11 INSPECTIONS AND TESTS BY AUTHORITIES HAVING JURISDICTION

A. Inspections and Tests by Authorities Having Jurisdiction: Contractor shall cause all tests and inspections required by authorities having jurisdiction to be made for Work under this Contract.

1. Except as specifically noted, scheduling, coordinating and conducting such inspections and tests shall be solely the Contractor's responsibility.

2. All time required for inspections and tests by authorities having jurisdiction shall be included in the Contract Time.

3. Costs for inspections and tests by authorities having jurisdiction will be paid by Owner.

1.12 INSPECTIONS AND TESTS BY SERVING UTILITIES

A. Inspections and Tests by Serving Utilities: Contractor shall cause all tests and inspections required by serving utilities to be made for Work under the Contract.

1. Except as specifically noted, scheduling, coordinating and conducting such inspections and tests shall be solely the Contractor's responsibility. All time required for inspections and tests by serving utilities shall be included in the Contract Time.

2. Except as specifically noted, all costs for inspections and tests by serving utilities shall be included in the Contract Sum.

1.13 INSPECTIONS AND TESTS BY MANUFACTURER'S REPRESENTATIVES

A. Inspections and Tests by Manufacturer's Representatives: Contractor shall cause all specified tests and inspections to be conducted by materials or systems manufacturers. Additionally, all tests and inspections required by materials or systems manufacturers as conditions of warranty or certification of Work shall be made, the cost of which shall be included in the Contract Sum.

1. Scheduling, coordinating and conducting such inspections and tests shall be solely the Contractor's responsibility. All time required for inspections and tests by manufacturer's representatives shall be included in the Contract Time.

2. All costs for inspections and tests by manufacturer's representatives shall be included in the Contract Sum.

1.14 INSPECTIONS BY INDEPENDENT TESTING AND INSPECTION AGENCY

A. Inspections by independent Testing Laboratory: Refer to Section 01 45 29 - Testing Laboratory Services.

PART 2 - PRODUCTS

Not applicable to this Section.

PART 3 - EXECUTION

Not applicable to this Section.

END OF SECTION

SECTION 01 45 29

TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for quality control services.

1. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, and governing authorities. They do not include Contract enforcement activities performed by the Owner or Architect.

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

1.3 RELATED SECTIONS

A. Section 01 45 00 - Quality Control: General requirements for inspections and tests.

B. Individual Product Specifications Sections: Specific requirements for inspections and tests.

1.4 RESPONSIBILITIES

A. Testing Laboratory: Owner will engage and pay for the services of an independent agency to perform inspections and tests specified as the Owner' responsibility.

1. Where the Owner has engaged a testing agency or other entity for testing and inspection of a part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless otherwise agreed in writing with the Owner.

B. Retesting: The Contractor is responsible for the cost of retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

1. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

C. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested.

D. Coordination: The Contractor, the Owner, Inspector, and each agency engaged to perform inspections, testing and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the Contractor shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for communicating to the Inspector the scheduling times for inspections, tests, taking samples and similar activities. E. Payment for Testing Laboratory Services:

1. Unless otherwise specified, Owner will pay for tests and inspections performed by Testing Laboratory, as specified in individual product Sections of the Specifications. Overtime costs due to scheduling for the convenience of the Contractor or to make up for Work behind schedule shall be deducted by Change Order from Contract Sum.

2. When tests and inspections are required on an overtime basis, initial payment will be made by the Owner. All costs for overtime testing and inspections shall be paid for by the Contractor and deducted by Change Order from the Contract Sum.

3. Unless otherwise specified, Contractor shall be back-charged for mileage and travel time for inspection services requiring more than fifty (50) miles from Project site to test unapproved substituted products purchased by Contractor.

    a. Testing laboratory shall forward all billings and records of such costs to Owner's Representative for approval.
    b. Such costs, if determined by Owner's Representative to be attributable to the Contractor under this provision, shall be deducted by Change Order from Contract Sum.

4. Contractor shall pay all costs for repeated observations, reinspection or retesting by Testing Laboratory due to non-conforming Work. Costs shall be deducted by Change Order from Contract Sum.

5. Additional Tests, Inspections and Related Services: Contractor shall be charged costs for additional tests, inspections and related services, due to the following. Such costs shall be deducted by Change Order from Contract Sum.

    a. Work is not ready to inspect when inspectors arrive.
    b. Failure to properly schedule or notify testing and inspection agency or authorities having jurisdiction.
    c. Changes in sources, lots or suppliers of products after original tests or inspections.
    d. Changes in means methods, techniques, sequences and procedures of construction that necessitate additional testing, inspection and related services.
    e. Changes in mix designs for concrete and mortar after review and acceptance of submitted mix design.
    f. Multiple off-site fabrication sites.
    g. Fabrication and installation errors.
    h. Inefficient, sporadic, or poorly organized manufacturing that causes additional testing costs to be incurred.

F. Segregation in Billing of Overtime Services: Billings for overtime services shall have straight time and overtime costs segregated and shall have substantiation by detailed explanations justifying necessity of services on overtime basis.

G. Obligation to Perform Work According to Contract Documents: Employment of Testing Laboratory shall in no way relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents and applicable Codes.

H. Limits on Testing Laboratory's Authority:

1. Testing Laboratory may not release, revoke, alter, or enlarge requirements of Contract Documents.

2. Testing Laboratory may not approve or accept any portion of the Work.

3. Testing Laboratory may not assume any duties of Contractor.

4. Testing Laboratory shall have no authority to stop Work.

I. Contractor's Responsibilities to Testing Laboratory: Contractor shall make the Work in all stages of progress available for personal and continuous observation by the Testing Laboratory.

1. Testing Laboratory shall have free access to any and all parts of the Work at all times.

2. Contractor shall provide the Testing Laboratory with reasonable facilities for Testing Laboratory to obtain such information as Testing Laboratory determines is necessary for Testing Laboratory to be kept fully informed of the progress and manner of performance of the Work and character of products, according to Testing Laboratory's duties and responsibilities.

3. Observation and inspection of the Work by Testing Laboratory shall not relieve Contractor from any obligation to fulfill the requirements of the Contract.

J. Retesting: When materials tested fail to meet requirements herein specified, they shall be promptly corrected or removed and replaced and retested in a manner required by Owner’s Representative. Costs involved in retesting shall be deducted by Change Order from Contract Sum.

1.5 TESTS AND INSPECTIONS

A. Tests and Inspections, General: All construction work shall be subject to inspection by the Owner and the Architect and all such construction or work shall remain accessible and exposed for inspection purposes until approved by the Owner.

1. The Owner will provide project personnel, including inspectors, to be available at the project site.

2. Approval as a result of an inspection shall not be construed to be an approval of a violation of the provisions of the building code or of other ordinances of the jurisdiction, including plans and specifications. Inspections presuming to give authority to violate or cancel the provisions of code, or of plans and specifications shall not be valid.

3. It shall be the duty of the contractor to cause the work to remain accessible and exposed for inspection purposes. Neither the Inspector nor the Owner or Architect shall be liable for expense entailed in the removal or replacement of any material required to allow inspection.

B. Inspection Requests: It shall be the duty of the Contractor doing the work to notify the Inspector that such work is ready for inspection. The Owner require that such work is ready for inspection. The Owner require

that every request for inspection be filed at least two working days before such inspection is desired. Such requests shall be in writing.

C. Approval Required: Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the Inspector. The Inspector, upon notification, shall make the requested inspections and shall either indicate in writing that portion of the construction is satisfactory as completed, or shall notify the
Contractor that same fails to comply with plans and specifications. Any portions of Work that do not

comply shall be corrected by the Contractor, and such portion shall not be covered or concealed until authorized by the Inspector.

1. There shall be a final inspection and approval of all buildings and structures when completed and ready for occupancy and use.

D. Inspection Coordination: Contractor shall provide, on a weekly basis, an anticipated Inspection Requirements Schedule, coordinated with the three-week look ahead schedule, showing the anticipated inspection needs for the following three weeks to facilitate appropriate Park coordination and interface as well as mobilization of required inspection staffing.

E. Required Inspections: Reinforcing steel, structural framework, or interior wall and/or ceiling support framing of any part of any building or structure shall not be covered or concealed without first obtaining the approval of the Inspector.

1.Listed below are the minimum 3rd Party Laboratory inspection requirements:

a. Subgrade compaction as defined by the Geotechnical Report
b. Backfill compaction as defined by the Geotechnical Report
c. Water Tests as specified in Division 22 and Division 32
d. Soil Tests as specified in Division 32
e. Other specified tests not listed

2. The Contractor shall be responsible for reviewing all of the Contract Documents for any additional inspection requirements.

1.6 SUBMITTALS

A. Reports: Owner' independent testing agency shall submit a certified electronic report of each inspection, test or similar service, to the Architect, the Owner, the Contractor, and the Inspector.

B. Report Data: Electronically distributed reports of each inspection test or similar service shall include, but not be limited to:

Date of issue
Project title and number
Name, address and telephone number of testing agency
Dates and locations of samples and tests or inspections
Names of individuals making the inspection or test
Designation of the Work and test method
Identification of product and Specification Section
Complete inspection or test data

Test results and an interpretation of test results
Ambient conditions at the time of sample-taking and testing
Comments or professional opinion as to whether inspected or tested
Work complies with Contract Document requirements
Name and signature of laboratory inspector
Recommendations on retesting.

1.7 SCHEDULES FOR TESTING

A. Testing and Inspection Schedule: After discussion with Owner's Representative and Testing Laboratory in advance of performance of testing and inspection services, Contractor shall determine dates and times necessary for Testing Laboratory to schedule performance of required tests and inspections and determine due dates for issuance of reports.

1. Integrate Testing and Inspection Schedule with Construction Schedule requirements specified in the Contract general Conditions.

2. Determine and indicate in Testing and Inspection Schedule necessary time for preparation and submission of reports of tests and inspections.

B. Revising Testing and Inspection Schedule: When changes of the construction schedule are necessary during construction, coordinate all such changes of schedule with the testing laboratory as required.

C. Adherence to Testing and Inspection Schedule: When the Testing Laboratory is ready to test according to the determined schedule but is prevented from testing or taking specimens due to incompleteness of the work, all extra costs for testing attributed to the delay may be back-charged to the Contractor and shall not be borne by the Owner.

1.8 CONTRACTOR'S RESPONSIBILITIES

A. Contractor's Responsibilities for Inspections and Tests:

1. Notify Project Inspector and Testing Laboratory two working days in advance of expected time for operations requiring inspection and testing services.

2. Deliver to Testing Laboratory or designated location, adequate samples of materials proposed to be used which require advance testing, together with proposed mix designs.

3. Cooperate with Owner's Representative, Testing Laboratory, Project Inspector, Architect, Architect's consultants and other responsible design professionals. Provide access to Work areas and off-site fabrication and assembly locations, including during weekends and after normal work hours.

4. Provide incidental labor and facilities to provide safe access to Work to be inspected and tested, to obtain and handle samples at the Work site or at source of products to be tested, and to store and cure test samples.

5. Provide at least 15 days in advance of first inspection or test of each type, a schedule of tests or inspections indicating types of tests or inspections and their scheduled dates.

6. Provide two working days notice to Owner's Representative, Architect and, as applicable, responsible design consultant, of each test and inspection.

1.9 INSPECTIONS TESTS BY OTHERS

A. Inspections by Others: Refer to Section 01 45 00 - Quality Control for requirements regarding observations and inspections by Owner's Representative, Architect and Project Inspector.

B. Tests by Others: Refer to Section 01 45 00 - Quality Control and individual product Specifications Sections for requirements regarding tests and inspections by product manufacturers and others, including serving utilities.

PART 2 - PRODUCTS

Not Applicable to this Section.

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. Repair and Protection: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements for "Cutting and Patching."

1. Protect construction exposed by or for quality control service activities, and protect repaired construction.

2. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION

SECTION 01 51 00

TEMPORARY UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Temporary utilities and services, including:

1. Heating and cooling during construction
2. Ventilation during construction
3. Temporary water service
4. Temporary sanitary facilities
5. Temporary power and lighting
6. Construction telephone service.

B. Removal of temporary utilities.

1.3 RELATED SECTIONS

A. Section 01 11 00 - Summary of the Work: Contractor's use of site and premises.

1.4 SUBMITTALS

A. Temporary Utilities: Submit reports of tests, inspections, applicable meter readings and similar procedures performed on temporary utilities.

1.5 TEMPORARY UTILITIES AND SERVICES

A. Temporary Utilities and Services, General: All utilities and other services necessary for proper performance of the Work shall be provided by Contractor, unless specifically noted otherwise. Refer to Contract General Conditions. Temporary utilities and services shall conform to all applicable requirements of authorities having jurisdiction and serving utility companies and agencies, including the following:

1. Requirements of authorities having jurisdiction, including:
   a. Cal OSHA
   b. California Building Code (CBC) requirements
   c. Health and safety regulations
   d. Utility agency and company regulations

e. Police, Fire Department and Rescue Squad rules

f. Environmental protection regulations

2. Standards:
   a. NFPA Document 241 - Building Construction and Demolition Activities.
   b. ANSI A10 Series - Safety Requirements for Construction and Demolition.
   c. NECA Electrical Design Library - Temporary Electrical Facilities.
   d. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with California Electrical Code (CEC).

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

C. Temporary Connections and Fees: Contractor shall arrange for services and pay all fees and service charges for the installation or maintenance of temporary power, water, sewer, gas and other utility services necessary for the Work.

1. Contractor shall apply for and obtain permits for temporary utilities, including permits for temporary generators, from authorities having jurisdiction.

2. All costs for temporary connections, including fees charged by serving utilities, shall be included in Contract Sum.

3. San Mateo County Parks Department will continue to pay the monthly bill based on metered usage.

D. Permanent Connections and Fees: Contractor shall arrange for utility agencies and companies to make permanent connections. Owner will arrange for permanent utility account and pay permanent connection fees. After Contract Completion review and determination that Work is acceptable, Owner will pay utility service charges for services delivered through permanent connections, for normal quantities.

E. Use of Temporary Utilities: Enforce strict discipline in use of temporary utilities to conserve on consumption. Limit use of temporary utilities to essential and intended uses to minimize waste and abuse.

1.6 PROJECT CONDITIONS

A. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on the site.

B. Contractor shall be responsible for building and individual room security to all areas of work where Contractor or its subcontractors enter and perform work.

1.7 TEMPORARY WATER SERVICE

A. Temporary Water Service: Contractor shall locate and connect to existing water source for temporary construction water service. Contractor shall comply with the following:

1. Locate and connect to existing water source for temporary construction water service, as acceptable to Owner’s Representative.

2. Extend branch piping with outlets located, so that water is available by use of hoses.

3. Temporary water service piping, valves, fittings and meters shall comply with requirements of the serving water utility and California Plumbing Code (CPC).

4. All costs to establish and maintain a temporary construction water system shall be included in the Contract Sum.

    1 San Mateo County Parks Department will continue to pay the monthly bill for metered use.

5. A backflow prevention device with a current inspection record is required when connecting to an existing distribution system.

    1 Confirm with The Owner in writing before attaching a backflow prevention device to an outlet in the field.

B. Use of Permanent Water System: Permanent water system may be used for construction water after completion, sterilization, testing and inspection of system and approval by Owner's Representative and authorities having jurisdiction.

1.8 TEMPORARY SANITARY FACILITIES

A. Temporary Sanitary Facilities: Provide and maintain adequate temporary sanitary facilities and enclosures for use by construction personnel.

1. Number of temporary toilets shall be suitable for number of workers.

2. Provide wash-up sink with soap, towels and waste disposal.

B. Use of Permanent Sanitary Facilities: The use of permanent sanitary facilities within the project site is approved. Immediately prior to Contract Completion review, thoroughly clean and sanitize permanent sanitary facilities used during construction.

1.9 TEMPORARY POWER AND LIGHTING

A. Temporary Power and Lighting, General: Comply with NECA Electrical Design Library - Temporary Electrical Facilities.

B. Temporary Power: Provide electric service as required for construction operations, with branch wiring and distribution boxes located to provide electrical service for performance of the Work.

1. Provide temporary electric feeder connected to electric utility service at location determined by Contractor and as approved by serving electric utility.

2. Temporary power conduit, raceways, fittings, conductors, panels, connections, disconnects, overcurrent protection, outlets and meters shall comply with requirements of the serving electric utility, California Electrical Code (CEC) and requirements of authorities having jurisdiction.

3. Contractor shall pay all costs to establish and maintain temporary electric service.

    1 San Mateo County Parks Department will continue to pay the monthly bill based on metered use.

4. As necessary in order to maintain construction progress, Contractor shall provide and pay all costs associated with generators used for temporary power.

C. Temporary Lighting: Provide temporary lighting as necessary for proper performance of construction activities and for inspection of the Work.

1. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

2. Maintain lighting and provide routine repairs.

D. Protection: Provide weatherproof enclosures for power and lighting components as necessary. Provide overcurrent and ground-fault circuit protection, branch wiring and distribution boxes located to allow convenient and safe service about site of the Work. Provide flexible power cords as required.

E. Service Disruptions: When necessary for energizing and de-energizing temporary electric power systems, minimize disruption of service to those served by public mains. Schedule transfers at times convenient to Owner.

F. Relamping: For permanent lighting used during construction, relamp all fixtures immediately prior to Contract Completion (Final Inspection) review.

1.10 CONSTRUCTION TELEPHONE SERVICE

A. Construction Telephone Service: Provide telephone service to Contractor's field staff by means of cellular telephone or other methods to enable communications between Owner’s Representative, Project Inspector and Contractor.

1. Include voice message services.

2. All costs of construction telephones shall be included in Contract Sum.

3. The use of personal cell phones is acceptable. A land line is not required.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials: Contractor shall provide new materials. If acceptable to the Owner Representative, undamaged previously used materials in serviceable condition may be used. Provide materials that are suitable for the use intended. Their use and methods of installation shall not create unsafe conditions or violate requirements of applicable codes and standards.

B. Equipment: Contractor shall provide new equipment; or, if acceptable to the Owner, Contractor may provide undamaged, previously used equipment in serviceable condition. Provide equipment that is suitable for use intended.

PART 3 - EXECUTION

3.1 TEMPORARY UTILITIES INSTALLATION

A. Temporary Utilities Installation, General: Contractor shall engage the appropriate local utility company or personnel to install temporary service or connect to existing service.

1. Use Charges: The cost for metered use of site utilities (electricity, water) will be paid by San Mateo County Parks Department.

2. Allowance for Utilities Charges: When Contract includes an allowance for metering of utility services, whether through temporary or permanent facilities, unused amount shall be returned to the Owner by deductive change order.

B. Water Service: Contractor may take water from the Owner's systems in such quantities and at such times as they are available. If this is done, Contractor shall provide all temporary materials necessary to extending the utility to where they will be used. Ensure that all temporary connections are downstream of a meter assigned to San Mateo County Parks Department.

C. Temporary Electric Power Service: Contractor may take electricity from the Owner's system if available. If this is done, Contractor shall provide all equipment, including connections, and other materials necessary for extending the utility lines to where they will be used. Contractor shall coordinate the installation with the Owner's Representative. Ensure that all temporary connections are downstream of a meter assigned to San Mateo County Parks Department.

1. When not available from the Owner, the Contractor must arrange and pay for electric service through the local utility or furnish their own portable power.

2. All permanent power used by the Contractor prior to Occupancy by the Owner shall be metered and paid for by the Owner.

D. Temporary Telephones: Contractor shall have telephone service available at its field office for the duration of contract where the Contractor and its superintendent may be contacted.

E. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, Contractor shall install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Contractor shall comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations." Contractor shall:

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.

2. Store combustible materials in containers in fire-safe locations.

3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.

4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

F. Maintenance of Temporary Utilities and Services: Contractor shall maintain temporary utilities and services in good operating condition until removal. Contractor shall protect utilities and services from environmental and physical damage.

3.2 TERMINATION AND REMOVAL OF TEMPORARY UTILITIES AND SERVICES

A. Termination and Removal of Temporary Utilities and Services: Unless the Owner require that it be maintained longer, Contractor shall remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Completion. Contractor shall complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. At Completion, Contractor shall clean and renovate permanent facilities that have been used during the construction period.

B. Removal of Temporary Underground Utilities and Restoration: Remove temporary underground utility installations to a minimum depth of two-feet below utility services. Contractor shall:

1. Backfill, compact and re-grade site as necessary to restore areas or to prepare for indicated paving and landscaping.

2. Restore paving damaged by temporary utilities. Refer to requirements specified in Section 01 73 29 - Cutting and Patching Requirements.

C. Cleaning and Repairs: Contractor shall clean exposed surfaces and repair damage caused by installation and use of temporary utilities and services. Where determined by Owner's Representative that repair of damage is unsatisfactory, the Contractor shall replace construction with matching finishes. Refer to requirements specified in Section 01 73 29 - Cutting and Patching Requirements.

END OF SECTION

SECTION 01 52 00

CONSTRUCTION FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. This Section specifies requirements for temporary services and facilities, including utilities, temporary construction fencing, construction and support facilities, security and protection.

B. Temporary utilities that are required include but are not limited to:

1. Water service and distribution.
2. Temporary electric power and light.
3. Telephone service.
4. Data services.

C. Temporary construction and support facilities that are required include but are not limited to:

1. Temporary heat
2. Field offices and storage sheds
3. Temporary enclosures
4. Hoists and temporary elevator use
5. Waste disposal services
6. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities that are required include but are not limited to:

1. Temporary fire protection
2. Barricades, warning signs, lights
3. Environmental protection.
4. Site security for theft.

1.3 ACTION SUBMITTALS

A. Layout of Field Offices and Sheds: Within ten (10) working days of the Notice-to-Proceed, Contractor shall submit to Owner's Representative a proposed layout for field offices, sheds and storage areas. Owner's Representative will review and respond within five working days with comments and directions. Contractor shall comply with directions of Owner's Representative.

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

1.4 INFORMATIONAL SUBMITTALS

A. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of Section 01 57 23, Storm Water Pollution Prevention.

B. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.

2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.

C. Dust Control Plan: Submit coordination drawing and narrative that indicates the dust-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate.

D. Temporary Utilities: Submit reports of tests, inspections, applicable meter readings and similar procedures performed on temporary utilities.

1.5 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of the authorities having jurisdiction, including but not limited to:

1. Cal OSHA

2. Building Code requirements

3. Health and safety regulations

4. Utility company regulations

5. Police, Fire Department and Rescue Squad rules

6. Environmental protection regulations.

B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library, "Temporary Electrical Facilities".

1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.

2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

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

1.6 PROJECT CONDITIONS

Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on the site.

B. Contractor shall be responsible for building and individual room security to all areas of work where Contractor or its subcontractors enter and perform work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials; if acceptable to the Owner Representative, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended. Their use and methods of installation shall not create unsafe conditions or violate requirements of applicable codes and standards.

B. All work areas within the Park and public spaces shall be fenced with minimum 6 feet chain link portable fence sections, with 1-1/2" top, bottom and side rails. All fencing shall be covered with green fabric shade cloth material, secured to top, bottom and side rails with integral metal eyelets. Shade cloth shall not be left unsecured. Fencing materials shall be maintained in good, damage free condition at all times.

1. Fencing shall extend around and enclose entire work area, as well as stored materials and equipment.
2. Fencing shall be secured in a closed condition when not required to be open to allow completion of the work. Fencing shall be secured each day at the close of work.
3. The use of alternate materials such as barricades, delineators and caution tape to enclose or delineate work areas will only be accepted by written approval of a work plan indicating where these barriers are required in lieu of chain link fencing.
4. 3 sand bags shall be placed on every stand. Contractor shall replace sand bags whenever a sand bag ruptures.
5. Contractor can tie-back fencing to fixed stakes as required in lieu of sand bags. Tie backs shall not be trip hazards.
6. Plastic water filled K-rail can be used in lieu of fencing when approved in advance by the Owner.

2.2 EQUIPMENT

General: Provide new equipment; or, if acceptable to the Owner, Contractor may provide undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended. B. First Aid Supplies: Comply with governing regulations.

C. Fire Extinguishers: Provide 2 hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL- rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

D. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

E. Temporary lighting: Provide adequate illumination to all areas of the project as required for ingress, egress, and prosecution of the Work. Provide cages where fixtures are exposed to potential breakage.

2.3 TEMPORARY FIELD OFFICE

A. The General Contractor may utilize the existing Park Foundation Offices (~2000sf with suitable rooms for meetings, offices, storage, employee break room, kitchen, and restroom.) If the contractor chooses not to use the available facilities, refer to Item C in this section.

B. Provide a space within the Contractor's field office building for the use of the Owner's Representatives when they are on-site. Fully equipped and ready for use within fourteen (14) days of the Notice-to-Proceed. The field office, if a trailer, and its appurtenances or accessories shall remain the property of the Contractor.

C. Building shall be of weather tight construction and contain a minimum of 600 square feet of floor space. Provide 8-foot minimum ceiling height. Provide two separate offices (minimum 120 square feet), a workroom/meeting room (minimum 240 square feet).

a The building may not contain a private restroom. Site Management personnel must use the same restroom facilities as the tradespeople and all other site workers. If the contractor uses the existing buildings, all restrooms must be made available to all personnel working on-site.

D. Provide at least six windows with security bars in the building, with at least one window for each room. Provide blinds for windows. Provide two entrance doors to the building, one at each end. Provide cylinder lock, and dead bolt and key on each door. Provide three sets of keys to the Owner's Representative.

a If the Contractor uses existing park structures, they do not have to add security bars to the existing windows.

E. Provide heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 degrees F.

F. Provide warm white, energy efficient light fixtures to evenly illuminate the rooms to a minimum of 50 foot-candles and an average of 70 foot-candles measured at desk height. Provide a minimum 60-watt light fixture in the lavatory facility. Provide light switch in each room.

G. Provide bottled drinking water service with hot and cold dispenser.

a If the contractor chooses to use the existing facility, the existing water supply is satisfactory. Ensure that water is available during planned outages.

H. Contractor shall pay all costs, including but not limited to, trailer rental, electrical service including installation, pole rental, conductor placement/rental, temporary electrical meters, etc, through the duration of the project. San Mateo County Parks Department will continue to pay for metered utility usage.

I. Provide high-speed wireless internet service for the Office. The Contractor is responsible to provide and install routers, cables, software, etc., to provide broadband Internet connections for the computers in the Trailer. The Contractor is responsible for all setup charges and monthly service charges payable to third-party broadband service provider (DSL or cable modem), necessary to provide unlimited broadband Internet access to the Owner's trailer (there is no charge for access to the network in the trailer).

J. Provide sufficient space in the temporary facilities for site personnel to cool off in the summer or warm up in the winter. Provide a clean, secure location for personnel to store their lunch and to eat if they choose to.

2.4 ACCESSORY EQUIPMENT

A. For each office:

1. Sufficient furniture to facilitate a clean and well-organized office. Existing furniture may be used if the Contractor chooses to use the existing Administrative Office in Flood Park.

B. For the workroom:

1. Sufficient furniture to facilitate a clean and well-organized work space where meetings can be held. There is no requirement for seating.

C. Computers: Each representative of The Contractor is required to have their own computer and be proficient in its use.

D. Business Machine for printing, copying, and scanning: Contractor shall provide a multifunction printer capable of copying and scanning in color, for both 8.5" X 11" and 11" X 17", automatic document feeder, collating capabilities. Contractor to provide maintenance, paper, toner, and all required supplies to operate copy machine throughout the duration of the project.

F. Provide refrigerator no less than 2.5 cubic feet. The existing refrigerator in the Administration Building is acceptable.

G. Provide emergency first aid kit appropriately sized for the project.

H. Provide all the above and all office supplies and stationery for the trailer, including, but not limited to, paper, pens, pencils, ink cartridges, laser printer cartridges file folders, binders, etc., for use throughout the duration of the project at the Contractor expense.

I. All equipment indicated above shall be fully operational. The Contractor shall maintain or replace failed or malfunctioning equipment within 48-hours (24 hours for computer and printer – related hardware) as directed by the Owner, or the Owner reserve the right to lease/purchase replacement equipment at the Contractor's expense.

J. Maintain the approach to the field office and keep it free of mud and standing water. Clean the office thoroughly on no less than a weekly basis.

2.5 PROJECT IDENTIFICATION

A. Provide two (2) project signs, constructed with 4' x 8', ¾ inch thick exterior grade plywood and mounted on two (2) 4" x 4" posts. The signs shall be produced by a professional sign maker. Propose locations for the sign as part of the site layout submittal. Place the signs conspicuously, near project entrances.

B. Submit a shop drawing of the sign before procurement. List title of project, the name of the Owner, the Contractor, and Architectural/Engineering team, as well as a Contractor phone number that the community may call with noise complaints 24-hours a day seven days a week. Owner shall approve signs before installation.

C. Erect signs on site at locations designated by the Owner. Install project identification signs within 5 days of Notice-To-Proceed.

D. No other signs are allowed without Owner permission except those required by law.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

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

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company or personnel to install temporary service or connect to existing service.

1. See Division 01 51 00 – Temporary Utilities

B. Water Service: Water may be taken from the Owner's systems in such quantities and at such times as they are available. If this is done, provide all temporary materials necessary to extending the utility to where they will be used. Contractor shall install a meter of type acceptable to the Owner and reimburse the Owner for the cost of any water used.

C. Temporary Electric Power Service: Electricity may be taken from the Owner's system if available. If this is done, provide all equipment, including connections, and other materials necessary for extending the utility lines to where they will be used. Coordinate the installation with the Owner Representative. Contractor shall install a meter of type satisfactory to Owner and reimburse the Owner for any power used. Where sub-metering is not possible or practical, a flat fee may be established and paid to the Owner.

1. When not available from the Owner, the Contractor must arrange and pay for electric service through the local utility or furnish his own portable power.
2. All permanent power used by the Contractor prior to Occupancy by the Owner shall be metered and paid for by the Contractor.
3. Install electrical power service underground, except where overhead service must be used.
4. Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics throughout construction period. As required, the system shall include, but not be limited to, the following: meters, transformers, overload protection disconnects, automatic ground fault interrupters, main distribution switchgear, distribution panels, etc.
5. Install and operate temporary lighting as required for proper security and protection. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.

D. Temporary Telephones: Contractor shall have telephone facility available at its business office for the duration of contract where the Contractor and its superintendent may be contacted. Cell phones are acceptable.

E. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

F. Work outside defined construction site: Comply with Section 01 55 00, Vehicular and Pedestrian Controls for requirements for all work that impacts areas outside of the Construction site perimeter as defined in

the contract documents. This includes ingress and egress to the site by construction personnel and vehicles.

G. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

H. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

I. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

J. Termination and Removal: Unless the Owner require that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired. At Completion, clean and renovate permanent facilities that have been used during the construction period.

3.3 SANITARY FACILITIES

A. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve projects needs.
   a. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility.
   b. Provide covered waste containers for used materials.

B. Contractor may elect to use existing Park sanitary facilities and provide additional facilities as necessary. Existing Park facilities that are outside of the construction area may not be used.

C. If sanitary facilities are temporary "porta-potty" type facilities, have them serviced as necessary but not less than twice per week. If facilities are modular trailer type with a connection to the sanitary sewer, have them serviced as necessary but not less than once per week. If the Contractor chooses to use the existing sanitary facilities, service them as necessary and not less than once per week.

3.4 SUPPORT FACILITIES

A. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not store materials more than seven days during normal weather or 3 days when temperature is expected to rise above 80 degrees F. Handle hazardous, dangerous or unsanitary waste by containerizing properly. Dispose of material lawfully.

   1. Furnish equipment necessary for refuse removal. Do not use Owner disposal bins or trash carts at any time.

B. Retain local exterminator or pest Control Company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ service to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

3.5 SECURITY

A. Prior to commencement of the work, initiate a security program and install enclosure fence with lockable entrance gates. Location shall be sufficient to encompass the entire area of construction operation.

   1. Install and maintain substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.

   2. Owner will not be liable for damage or loss to the Work due to trespass or theft. In addition, the Owner or Owner shall not be liable for loss or damage to Contractor's materials, tools, or equipment. The contractor is solely responsible for the security the contractor's work area.

   3. The Contractor may elect to use existing fences, walls, or other barriers to limit the use of temporary fencing. The use of an existing barrier does not transfer liability for site security to the owner of that barrier.

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

   1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

3.6 REMOVAL OF CONSTRUCTION FACILITIES

A. Removal of Construction Facilities: Unless otherwise mutually agreed by Owner's Representative and Contractor, remove temporary materials, equipment, services, and construction prior to Contract Completion review.

1. Coordinate removal with requirements specified in Section 01 51 00 - Temporary Utilities, Section 01 55 00 - Vehicular and Pedestrian Controls and Section 01 57 00 - Temporary Controls.

2. Completely remove in-ground construction facilities to minimum depth of two feet. Backfill, compact and regrade site as necessary to restore areas or to prepare for indicated paving and landscaping.

B. Cleaning and Repairs: Clean and repair damage caused by installation or use of temporary construction facilities on public and private rights-of-way.

END OF SECTION

SECTION 01 55 00

VEHICLE AND PEDESTRIAN CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Section specifies requirements for construction activities impacting the Park Community outside the designated construction site, as well as requirements for Contractor ingress to and egress from the project site. Section includes, but is not limited to the following:

1. Construction activities within or adjacent to pedestrian walkways and thoroughfares.
2. Construction within landscape and hardscape areas outside the designated Project site area.
3. Procedures for work within city streets and Park roads.
4. Haul routes and temporary traffic Control.
5. Contractor parking.

1.3 WORK WITHIN AREAS OF PEDESTRIAN ACCESS

A. General: These requirements apply to all work required on the Park outside the designated Project Site. Requirements also apply to activities occurring on the Project Site, which impact adjacent areas of the Park.

B. Fencing of Work Areas

1. All work areas within the Park and public spaces shall be fenced with **minimum 6 foot high chain link portable fence sections**, with 1-1/2" top, bottom and side rails. All fencing shall be covered with green fabric shade cloth material, secured to top, bottom and side rails with integral metal eyelets. Shade cloth shall not be left unsecured. Fencing materials shall be maintained in good, damage free condition at all times.
    a. Fencing shall extend around and enclose entire work area, as well as stored materials and equipment.
    b. Fencing shall be secured in a closed condition when not required to be open to allow completion of the work. Fencing shall be secured each day at the close of work.
    c. The use of alternate materials such as barricades, delineators and caution tape to enclose or delineate work areas will not be accepted.
    d. 3 sand bags shall be placed on every stand. Contractor shall replace sand bags whenever a sand bag ruptures.
    e. Contractor can tie-back fencing to fixed stakes as required in lieu of sand bags. Tie backs shall not be trip hazards.
    f. Plastic water filled K-rail can be used in lieu of fencing when approved in advance by the Owner.

C. Sidewalk Closures and Restrictions

1. Use Cal-Trans Standard reflectorized signage where required to indicate closure of sidewalks, temporary revisions to crosswalks and other impacts to normal pedestrian walk routes.
2. Where sidewalks are partially restricted due to construction activities, a minimum width of 48" shall be maintained.
3. Bases for temporary fencing shall not extend into the required walk area.
4. Where portions of a sidewalk are temporarily closed, temporary fencing shall be placed at the nearest intersection to prevent the site impaired from traveling in a direction that will require them to eventually stop and return to said intersection. Pedestrian detour signs and "sidewalk closed" signs shall also be provided at the point of closure.

D. Access for construction equipment and material deliveries

1. All haul routes and delivery routes shall conform to the routes designated in Contractor's approved Work Plans. Refer to Section 01 14 00 for requirements.
2. Times for delivery of materials and hauling shall comply with the requirements of the Contract Documents and approved Contractor Work Plans.
3. No staging or parking of vehicles or construction equipment will be allowed outside the Project Site, except within the work areas designated in the approved Contractor Work Plans.
4. Flagman Requirements
   a. All major vehicles and equipment using approved haul routes that travel over inter-Park pedestrian thoroughfares shall be escorted by at least one flagman until the vehicle or equipment is within the confines of the project site. Contractor is advised that the Park Community includes a large volume of guests and staff with disabilities, including but not limited to wheel chair users, persons with hearing impairments, and persons with sight impairments; for this reason, escorting of equipment and vehicle traffic will be strictly enforced.
      1) Flagman shall be trained and shall direct pedestrians and traffic in accordance with the requirements set forth in Article 1.4 below.
   b. Entry exit gates to the project site shall be left in a closed position at all times, unless a flagman is stationed at the gate to control unauthorized entry into the project site.
5. Maintenance of Thoroughfares
   a. Pedestrian thoroughfares and crossings shall be maintained in a safe, clean condition, free of dirt, gravel and other debris resulting from construction operations at all times.
   b. Where work occurs on or adjacent to pedestrian thoroughfares, Contractor shall employ adequate measures (such as sandbagging, earthen barriers, etc.) to ensure that walks are protected from overflow of construction materials or runoff into the pedestrian area.
   c. Where work occurs on or adjacent to pedestrian thoroughfares, Contractor shall employ adequate measures to ensure that walks are protected from overhead hazards, such as falling debris. Provide covered walkway structures and other measures as required to comply with O.S.H.A. standards.
   d. Contractor shall confirm local Fire Dept. requirements for access to the construction site and other Park facilities impacted by the Work throughout the course of construction. Where Fire Dept. access must be maintained at specific areas, Contractor shall tailor the Work Plan and provide necessary temporary measures to accommodate requirement.
6. Trenching Operations
   a. Where trenching occurs through, across or adjacent to pedestrian thoroughfares, the work shall comply with the approved Work Plan for the area in question.
   b. Temporary pedestrian crossings required due to trenching operations:
      1) Steel plating shall be placed across trenches and trench bracing shall be installed in accordance with W.A.T.C.H. standards as referenced in section 1.04 below.

2) Minimum 6 feet high chain link fencing sections (per paragraph 1.2-B above) shall be installed inside the edge of the plating on each side to clearly delineate the path of travel and prevent pedestrians from stepping into trench area.

3) All steel plating shall have beveled edges and shall comply with A.D.A. requirements for path of travel. Edges of plates at each approach shall be painted

with a 1" safety yellow contrasting band. Plating shall be anchored in accordance with W.A.T.C.H. standards and carry appropriate traffic ratings where it is required to carry emergency response vehicle traffic.

4) The use of barricades, delineators and or caution tape in lieu of the required temporary fencing sections is unacceptable.

1.4 WORK WITHIN ROADWAYS AND PARKING AREAS

A. General Requirements

1. All construction activities which occur within Park roadways and parking areas shall comply with the 2012 version of the City of Los Angeles Work Area Traffic Control Handbook (W.A.T.C.H.) for traffic control, signage and barricading, as supplemented by these specifications. Where conflicts exist between specific requirements, the more stringent requirement shall apply.
   W.A.T.C.H. standards are available from Building News Inc., 3055 Overland Ave., Los Angeles, Ca., 90034 - Phone: 310/202-7775.
2. Flagman requirements and operations shall comply with W.A.T.C.H. standards and the State of California, Dept. of Transportation "Instructions to Flaggers" - 2012 Edition.
3. Signage: All temporary traffic control signage shall comply with California Vehicle Code Section 21400 and California Dept. of Transportation (Cal-Trans) standards. All signage shall be reflectorized.
4. Where trenches, excavations or other work is required within streets, the Work shall be scheduled so as to maintain a minimum of one open traffic lane at all times. A minimum of two lanes as required allowing safe 2-way traffic shall be restored prior to completion of Contractor's operations each day.
5. All work within Owner roadways and parking areas requires approval of Contractor's Work Plan prior to commencement. Refer to Section 01 14 00 for Work Restrictions.

B. Fencing, Barricades and Traffic Plating

1. All work areas shall be fenced in compliance with paragraph 1.3-B above. Modifications to this requirement due to specific access requirements for completion of the work shall be requested by Contractor in the Work Plan Submittal for a designated area.
2. Type 1 Barricades as referenced in the W.A.T.C.H. standards are not acceptable for use on the Project. Contractor shall use type II or type III barricades where required.
3. Where temporary traffic controls must remain in place overnight or at other times when Contractor is not continuously present in the work area, cones, plastic delineators and other lightweight traffic control devices subject to displacement shall not be used for traffic control.
4. Where temporary fencing and/or barricades remain in place overnight, Type II barricades with flashing amber lights shall be used to delineate the protruding corners of the of the work area enclosure at the approach from each direction.
5. Where trenches or excavations of a depth of 3'-0" or deeper and a width of 2'-0" or greater are directly adjacent to a drive lane, the trench shall be plated in accordance with W.A.T.C.H. standards, or concrete barricades (k-rail) shall be installed to protect vehicle traffic from entering the excavation during times when the work area is not manned by Contractor.

6. Where trenches or excavations of a depth of 4’-0” or greater are directly adjacent to a drive lane or pedestrian walk, the protective fencing shall be a minimum horizontal distance of 4’-0” from the edge of the excavation.
7. All traffic plates shall be beveled in the direction of vehicle traffic and secured in place. Where work occurs at pedestrian crossings, comply with Article 1.3 above.
8. Comply with W.A.T.C.H. standards for sizing of traffic plates and shoring of trenches up to 4’ in width. For trenches exceeding 4’ in width, Contractor shall engage a Civil Engineer registered in the State of California to design plating and shoring system.

C. Flagman Requirements

1. Whenever existing traffic lanes are altered, contractor shall provide properly equipped and trained flagmen to direct traffic. Comply with W.A.T.C.H. standards and Cal-Trans “Instructions to Flaggers”.
2. Whenever a section of two-way traffic is temporarily reduced to one lane, a minimum of two flagmen shall be provided to ensure proper traffic control in each direction. 2-way radio devices shall be used for communication between the flagmen where both direct line of site and audible communication cannot be maintained.
3. Flagmen shall be dedicated solely to traffic and pedestrian control and shall not perform additional duties while assigned as flagmen.

D. Signage

1. Traffic control signage shall be provided as required for safe and proper direction of vehicles and in accordance with the requirements listed in paragraph 1.4-A-3 above.
2. All signage shall be reflectorized.
3. Temporary traffic control signs shall be California Dept. of Transportation standard type as listed in the following schedule.

Sign Type	Designation	Size
Stop	R1R	30 x 30
Speed limit	R2R	24 x 30
Keep right/left	R7R	18 x 24
Do not enter	R11R	24 x 24
No right turn	R16R	24 x 24
No left turn	R17R	24 x 24
No parking	R26DR	12 x 12
No parking/fire lane	R26RFL	12 x 18
No parking anytime	R28R	12 x 18
Yield	R39R	30” triangle
Disabled parking	R99R	12 x 18
Exit only	R108R	18 x 24
Enter only	R109R	18 x 24
No pedestrians	R96R	18 x 18
Use crosswalk	R96BR	18 x 12
Two-way traffic ahead	R40R	24 x 30
Merge	WLR (L) or (R)	24 x 24

E. Haul Routes

1. Haul Routes for Construction activities and delivery of materials shall strictly adhere to routes designated in the contract documents. All vehicles and equipment are required to use designated routes only. Deviations from designated haul routes shall only be permitted where previously authorized in Contractor’s approved Work Plans.
2. Continuous or major hauling on Park roads shall be restricted to the hours of 7:00 am through 6:00 p.m. unless otherwise authorized by the Owner Representative.

3. Contractor shall comply with hauling and truck traffic requirements on all City roads and shall obtain all required permits and authorizations. Weight loads carried by vehicles shall be within capacity recommended by manufacturer and shall comply with applicable laws and regulations relating to allowable capacities for specific roads.
4. Roads shall be maintained in a clean condition at all times. Sweeping of roads shall occur at minimum on a daily basis, or more often as required by continual hauling operations or construction traffic.
5. All loads shall be covered with secured tarpaulins when gravel, asphalt, debris, or other loose materials are removed from or hauled into the Park.
6. Truck staging shall not occur on any Park road, or City road within the Park, unless prior authorization is received through approval of the Contractor's Work Plan.

7. Provide protection against damage to existing sidewalks, curbs and gutters and other improvements at locations where construction vehicles enter. Contractor shall be responsible for repair of all damage resulting from its operations. Damage to concrete shall be repaired by replacement of full sections to the nearest existing construction joint in each direction.

F. Emergency Response Access

1. Contractor shall maintain adequate provisions for passage of emergency response vehicles (ambulances, fire trucks etc.) over Park roads and inner-Park thoroughfares at all times.
2. At all times that work is occurring which requires trenching, excavations, or other blockages of any fire lane or emergency access location, Contractor shall have traffic plating and other materials and equipment on hand as required to permit immediate passage of response vehicles in the case of an emergency. At no time shall said blockages be left unmanned.

1.5 PARKING CONTROL

A. Contractor, subcontractors and suppliers shall park within the Construction site and other authorized areas as identified in the Contract Documents.

B. Contractor, subcontractors and suppliers shall at no time park any vehicle on the inner-Park grounds, outside the confines of the construction site as designated in the Contract Documents. Vehicles in non-compliance will be cited and towed at the Contractor's expense.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

3.1 MAINTENANCE OF PARKING AND ACCESS ROADS

A. Maintenance: Contractor shall maintain traffic and parking areas in a sound condition. Contractor shall repair breaks, potholes, low areas, standing water and other deficiencies, to maintain paving and drainage in original or specified condition.

B. Cleaning of Sidewalks, Roadways, and Parking Areas: Contractor shall keep public and private rights-ofway and parking areas clear of construction-caused soiling, dust and debris, especially debris hazardous to vehicle tires.

1. Contractor shall inspect and perform cleaning hourly to ensure entire public commons areas, sidewalks, crosswalks, roadways, haul routes, and parking lots are free of all debris.

Contractor shall provide dedicated laborers and equipment as required to ensure areas are kept neat and clean during each day of the contract.

2. Contractor shall coordinate with requirements specified in Section 01 57 00 - Temporary Controls and Section 01 74 00 - Cleaning Requirements.

END OF SECTION

SECTION 01 55 29

CONSTRUCTION STAGING AREAS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Contractor Staging Area requirements.

1.3 RELATED SECTIONS

A. Section 01 11 00 - Summary of the Work: Contractor's use of site and premises.

B. Section 01 52 00 - Construction Facilities: Field offices and sheds.

C. Section 01 35 53 - Security

D. Section 01 55 00 - Vehicular & Pedestrian Controls

E. Section 01 57 00 - Temporary Controls

G. Section 01 74 00 - Cleaning Requirements: Periodic cleaning and cleaning for Final Completion review.

1.4 SUBMITTALS

A. Shop Drawings: Prior to site mobilization, Contractor shall prepare and submit for review by Owner’s Representative a site plan indicating detailed layout of Contractor Staging Area, including:

1. Temporary utilities
2. Temporary fencing and gates
3. Temporary offices and sheds
4. Construction aids
5. Vehicular access ways and on-site parking
6. Temporary barriers and enclosures
7. Storm water pollution prevention measures

PART 2 - PRODUCTS

Not applicable to this Section.

PART 3 - EXECUTION

3.1 CONTRACTOR STAGING AREA REQUIREMENTS

A. Contractor Staging Areas: Refer to reference drawings included in the set of Contract Drawings for location of Contractor Staging Areas.

1. Contractor shall use only site areas designated specifically by Owner as Contractor Staging Area for the Project.

2. Contractor Staging Area for the Project shall be clearly indicated on site plan. Contractor shall remove equipment placed or located outside of areas designated for Contractor Staging Area to within Contractor Staging Area at no change in Contract Time and Contract Sum.

3. Contractor shall keep access to Contractor Staging Areas and other construction access ways and thoroughfares clear at all times. Contractor shall provide traffic and parking control signage acceptable to Owner's Representative.

B. Cleanliness: Contractor shall keep Staging Area clear of trash and debris and in neat order. Contractor shall be responsible for cleanliness and order of assigned Staging Areas, as acceptable to Owner's Representative.

3.2 REMOVAL OF CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

A. Removal of Construction Facilities and Temporary Controls: Unless otherwise mutually agreed by Owner's Representative and Contractor, Contractor shall remove temporary materials, equipment, services, and construction prior to Contract Completion review. Contractor shall coordinate removal with requirements specified in Section 01 51 00 - Temporary Utilities, Section 01 52 00 - Construction Facilities, Section 01 55 00 - Vehicular & Pedestrian Controls and Section 01 57 00 - Temporary Controls.

B. Cleaning and Repairs: Contractor shall clean and repair damage caused by installation or use of temporary facilities on public and private rights-of-way.

C. Removal of Temporary Utilities and Restoration: Contractor shall remove temporary underground utility installations to a depth of two feet. Backfill, compact and regrade site as necessary to restore areas or to prepare for indicated paving and landscaping.

END OF SECTION

SECTION 01 56 39

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Requirements to preserve, protect, and prune as necessary existing trees and shrubs, and other vegetation indicated to remain.

B. All trees and plant materials to remain on site shall be protected from all trades working on the job, and it shall be the Contractor's responsibility to insure that all subcontractors are aware of and held responsible for any damage to existing trees and plant material. In addition, Contractor shall be held responsible to insure that following protective measures are carried out throughout the entire construction period.

C. Maintenance: Throughout the life of the construction project, the Contractor shall be responsible for overseeing the watering, fertilizing, pruning, and other measures necessary to protect all existing trees, lawns, shrubs, groundcover and other plants.

1.3 RELATED REQUIREMENTS

A. Section 01 57 00 – Temporary Controls

B. Section 01 57 23 – Storm Water Prevention Pollution.

C. Division 32 – Exterior Improvements: Landscaping specifications related to trees, shrubs and ground covers, as applicable.

1.4 QUALITY ASSURANCE

A. Arborist: Contractor shall engage and pay a Certified Arborist who will be responsible for supervising implementation of tree and plant protection measures specified in this Section.

1. Arborist shall be subject to acceptance by Owner’s Representative.
2. Arborist registered by the American Society of Consulting Arborists.
3. Submit evidence contract with acceptable Certified Arborist prior to commencing site mobilization activities.

PART 2 - PRODUCTS

2.1 BARRIERS

A. Barriers: As specified in Section 01 57 10 – Existing Finish Protection.

2.2 FERTILIZER

A. Fertilizer: Unless otherwise directed by Owner's Representative, type and quantity of fertilizer shall be determined by soil agronomist engaged and paid by Contractor, who is acceptable to Owner's Representative.

1. As basis for bidding, fertilizer shall be Romeo "Greenbelt" 22-14-14 tree fertilizer or approved equal at 4 lb. fertilizer dissolved in 100 gallons water.

B. Accessory Materials: As determined by Contractor as necessary for sustained health of trees and plants, subject to acceptance by Owner's Representative. Accessory materials shall include mulch, tree and plant stakes and temporary covers.

PART 3 - EXECUTION

3.1 PROTECTION

A. Protection: Prior to construction activities, especially demolition and excavation, on the site, Contractor shall submit to Owner's Representative evidence of a contract with a Certified Arborist who shall be responsible for supervising implementation of the following tree protection measures.

1. Protect all existing trees, shrubs and ground covers from stockpiling, material storage including soil, vehicle parking and driving within the tree drip line. Restrict foot traffic to prevent excessive compacting of soil over root systems.
2. Protect root systems of existing trees, shrubs, and ground covers from damage due to chemically injurious materials in solution caused by runoff and spillage during mixing, placement of construction materials, and drainage from stored materials.
3. Protect root system from flooding, erosion, excessive wetting and drying resulting from de-watering and other operations.
4. Above-ground surface runoff shall not be directed into the tree canopy area from adjacent areas. Ensure that sidewalks or other construction do not trap water near the tree. Coordinate with requirements specified in Section 01 57 00 - Temporary Controls.
5. Protect existing plant materials from unnecessary cutting, breaking and skinning of roots and branches, skinning and bruising of bark.
6. Use no soil sterilants under pavement near existing trees.
7. Do not allow fires under and adjacent to existing trees or plants.

B. Maintenance: Throughout duration of the Contract, Contractor shall be responsible for irrigation, fertilizing, pruning, and other measures necessary to protect and nurture all existing trees, plants, ground covers and lawns indicated to remain in Project.

3.2 PRUNING

A. Engage the Consulting Arborist registered by the American Society of Consulting Arborists, or approved equal. Arborist shall direct removal of branches from trees and large shrubs, and correctional pruning and cabling of specified trees that are to remain, if required to clear new construction and where indicated. Arborist shall also direct necessary tree root pruning and relocation work.

B. Where indicated by Owner Representative, extend pruning operation to restore natural shape of entire tree using only Western Chapter ISA Pruning Standards.

C. Cut branches and roots with sharp pruning instruments. Do not break, chop, or mutilate.

D. Pruning of existing trees shall concern itself with removing all dead wood 1/2" or greater in size, removing vines and/or sucker growth. Tree cavities existing on all oak trees are to be cleaned of wood rot. The procedure for each tree may vary and will need to be approved by the Consulting Arborist prior to commencing work.

E. Tree limbs in the way of proposed buildings shall only be trimmed by reputable ISA Certified Arborist or ISA Certified Climber and shall approved by Owner's Representative.

3.3 IRRIGATION

A. Irrigate trees and other vegetation that are to remain as necessary to maintain their health before, during and after the course of the work as directed by the Consulting Arborist. Maintain an irrigation schedule and document. Submit schedule to Owner's Representative for review and acceptance.

B. If the soil within the drip line of the tree is compacted, then prior to watering or fertilizing trees, the area within the drip line of the tree shall be rototilled to loosely break up the top two (2) inches of existing soil.

C. All trees shall be deep root watered by the use of an injection needle to a depth of eighteen (18) inches. Needle shall be inserted into the ground five (5) feet apart in concentric rings around the tree; each ring is four (4) feet wider than the previous one. This process shall continue out to the drip line of the tree.

D. Trees greater than twelve (12) inches in caliper shall be watered during the first month of construction using 800 gallons of water per tree [actual amount TBD]. For trees less than twelve (12) inches in caliper, 600 gallons of water shall be used per tree [actual amount TBD]. This procedure shall be repeated every six (6) months, in addition to the normal watering schedule.

3.4 FERTILIZING

A. All trees shall be fertilized before, during, and after construction by pumping under pressure directly 18-inches into root zone as directed by Certified Arborist.

3.5 EXCAVATION AROUND TREES

A. Excavate within drip lines of trees only where indicated.

B. Where trenching for utilities is required within drip lines, tunnel under and around roots of 2 1/2" diameter or larger by hand digging. Do not cut main lateral roots that are 2" or larger. Cut smaller roots

that are smaller than 2" which interfere with installation of new work. Use sharp approved pruning tools. Pipes should be routed into an alternate location to avoid conflict, wherever possible.

C. Where excavating for new construction is required within drip lines of trees, hand excavate to minimize damage to root systems. Use narrow tine spading forks and comb soil to expose roots. Relocate roots in backfill areas wherever possible. If large, main lateral roots are encountered, expose beyond excavation limits as required to bend and relocate without breaking.

D. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately six (6) inches back from new construction. Cover cut ends with plastic sandwich bag.

E. Do not allow exposed roots to dry out before permanent backfill is placed. Provide temporary earth cover, pack with wet peat moss or four (4) layers of wet untreated burlap and temporarily support, and protect from damage until permanently relocated and covered with backfill. Water to eliminate voids and air pockets.

F. Thin branching structure in accordance with Western Chapter, ISA Pruning Standards to balance loss to root system caused by damage or cutting of root system. Thinning shall not exceed 30% of existing branching structure.

3.6 GRADING AND FILLING AROUND TREES

A. Maintain existing grade within drip line of trees unless otherwise indicated. Any grade change shall be limited to six (6) inches of cut or fill from the original grade and shall be accomplished by hand. Under all [*Park to insert types of trees*] trees there shall be no grade change under at least the inner 50% of the tree canopy.

B. Lowering Grades: where existing grade is above new finish grade shown around trees, carefully hand excavate within drip line to new grade. Cut roots exposed by excavation to approximately three (3) inches below elevation of new finish grade.

C. Raising Grades: permitted only as acceptable to Owner Representative.

D. If building pads or foundations are to be constructed within the fenced areas or if the existing landscape is to be altered by the addition of fill or reduced by excavation, the Owner Representative shall be notified prior to this work. Measures as approved by the Owner Representative, such as small retaining walls or subgrade aeration lines, may be required to mitigate construction procedures affecting the tree.

3.7 REPAIR AND REMOVAL OF TREES

A. Repair and Removal of Trees: Certified Arborist and Owner’s Representative will determine whether trees shall be restored or removed. Treat and restore trees damaged by construction operations in a manner acceptable to Owner’s Representative. Perform restoration and pruning promptly after damage occurs to prevent progressive deterioration of damaged trees. If trees cannot be restored, equitable adjustment to Contract Sum shall be made to compensate Owner for loss, in accordance with the Contract General Conditions.

1. Remove dead and damaged trees that are determined by Certified Arborist to be incapable of restoration to normal growth pattern.

2. Contractor shall be liable for all damage and necessary restoration actions to existing trees, including trunk, branches, or roots. Restoration shall be performed under direction of Certified Arborist.

3.8 REPAIR AND REPLACEMENT OF SHRUBS AND GROUND COVER

A. Repair shrubs and other vegetation damaged by construction operations in a manner acceptable to Owner Representative. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged plant.

B. Remove and replace all dead and damaged plants that are determined by the Owner Representative to be incapable of restoration to normal growth pattern.

1. Provide new shrubs of same size and species as those replaced or as acceptable to the Owner Representative.
2. Plant and maintain as specified under Division 32.

C. Repairs and Replacements of Shrubs and Ground Cover: Repair shrubs and other vegetation damaged by construction operation in manner acceptable to Owner's Representative.

1. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged plant. Remove and replace all dead and damaged plants up to six-inch diameter, which are determined by Owner's Representative as being incapable of restoration to normal growth pattern.
2. Provide new shrubs of same size and species as those replaced or as acceptable to the Owner's Representative.

3.9 COMPENSATION TO OWNER FOR LOST AND DAMAGED TREES

A. The Contractor shall be liable for the loss in value to damaged trees and for all repair or replacement costs resulting from construction operations as determined by the Owner Representative. Because of the irreplaceable nature of many of the existing trees, the amount of assessment shall be determined by the Owner Representative, depending upon tree species, condition before damage, and location value.

B. Designated sums shall be governed by applicable provisions of the Contract General Conditions

END OF SECTION

SECTION 01 57 00

TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. The requirements for the following subjects are included in this Section:

1. Environmental Protection Plan
2. Smoke/Odor Control
3. Noise Control
4. Dust and Air Pollution Control
5. Welding and Burning
6. Erosion and Sediment Control
7. Disposal Operations
8. Cultural Resources

1.3 PROTECTION OF EXISTING CONDITIONS

A. Protection of Adjacent Facilities: Contractor shall restrict Work to limits indicated on the Drawings and as specified in Section 01 11 00 - Summary of the Work. Protect existing, adjacent facilities from damage, including soiling and debris accumulation.

B. Video and Photo Record of Existing Conditions: Contractor shall produce video record and photo records of all existing conditions within and adjacent to Project area.

1. Video record shall be made with sound to record comments to identify locations and describe conditions. Photo records shall be made available on a USB drive
2. Owner’s Representative will accompany Contractor during recording of existing conditions but will not direct recording process.
3. Video and photo record shall capture the state of existing features, including but not limited to:
    a. Paving
    b. Landscaping
    c. Building surfaces
    d. Utilities
    e. Lighting standards, fencing, signage and other site appurtenances
4. Contractor shall retain one copy and deliver one copy of video and photo record to Owner’s Representative within seven calendar days after they have been produced.
5. Video and photo record shall be used to verify restoration of existing conditions after completion of construction activities.

6. Existing features not recorded shall be restored as directed by Owner's Representative, including reconstruction and refinishing as determined necessary by Owner's Representative.

C. Existing Utilities - Should the Contractor break any utility the contractor should immediately act to repair the utility. Contractor shall continuously work to repair broken utilities to minimize impact to the Owner.

D. Contractor shall maintain spare parts and materials to repair all utilities, water lines, sewer lines, etc.

1.4 ENVIRONMENTAL PROTECTION PLAN

A. The requirements of the Article are in addition to those of the Contract General Conditions.

B. During the progress of the work, keep the premises occupied in a neat and clean condition and protect the environment both on site and off site, throughout and upon completion of the construction project.

C. In coordination with the Park, develop an Environmental Protection Plan in detail and submit to the Owner Representative within 30 calendar days from the date of commencement specified in the Notice to Proceed. Distribute the approved plan to all employees and to all subcontractors and their employees. The Environmental Protection Plan shall include, but not be limited to, the following items:

1. Copies of required permits.
2. Proposed sanitary landfill site.
3. Other proposed disposal sites.
4. Noise Control.
5. Dust Control.
6. Erosion and Sediment Control.
7. Copies of any agreements with public or private landowners regarding equipment, materials storage, borrow sites, fill sites, or disposal sites. Any such agreement made by the Contractor shall be invalid if its execution causes violation of local or regional grading or land use regulations.
8. Hazardous waste disposal procedures.

D. Requirements: All operations shall comply with all federal, state and local regulations pertaining to water, air, solid waste and noise pollution.

E. Definitions of Contaminants:

1. Sediment: Soil and other debris that have been eroded and transported by runoff water.
2. Solid waste: rubbish, debris, garbage and other discarded solid materials resulting from construction activities, including a variety of combustible and non-combustible wastes, such as ashes, waste materials that result from construction or maintenance and repair work, leaves and tree trimmings.
3. Chemical Waste: Includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, disinfectants, organic chemicals and inorganic wastes. Some of the above may be classified as "hazardous."
4. Sanitary Wastes:
   a. Sewage: domestic sanitary sewage.
   b. Garbage: refuse and scraps resulting from preparation, cooking, dispensing and consumption of food.
5. Hazardous Materials: Except as otherwise specified, in the event the Contractor encounters on the site material reasonable believed to be asbestos, polychlorinated biphenyl (PCB), or other hazardous materials which have not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner in writing. The Work in the affected area

shall not thereafter be resumed except by written agreement of the Owner and Contractor if in fact the material is asbestos, PCB, or other hazardous materials and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos, PCB, or other hazardous materials, or when such materials have been rendered harmless.

F. Protection of Natural Resources:

1. General: It is intended that the natural resources within the project boundaries and outside the limits of permanent work performed under this Contract be preserved in their existing condition or be restored to an equivalent or improved condition upon completion of the work. Confine construction activities to areas defined by the public roads, easements, and work area limits shown on the drawings. Except where otherwise noted, return construction areas to their pre-construction elevations. Maintain natural drainage patterns. Conduct construction activities such that ponding of stagnant water conducive to mosquito breeding habitat will not occur at anytime.
2. Land Resources: Do not remove, cut, deface, injure or destroy trees or shrubs outside the work area limits. Do not remove, deface, injure or destroy trees within the work area without permission from the Architect. Such improvements shall be removed and replaced, if required, by the Contractor at his own expense.
    a. Protection: Protect trees that are located near the limits of the Contractor's work areas which may possibly be defaced, bruised or injured or otherwise damaged by the Contractor's operations. No ropes, cables or guys shall be fastened to or be attached to any existing nearby trees or shrubs for anchorages. No vehicles or equipment shall be parked within the extents of the canopy of any tree.
    b. Trimming: Refer to Tree and Plant Protection Section 01 56 39.
    c. Excavation Around Trees: Refer to Tree and Plant Protection 01 56 39.
    d. Repair or Restoration: Repair or replace any trees or other landscape feature scarred or damaged by equipment or construction operations as specified below. The repair and/or restoration plan shall be reviewed and approved by the Owner and Architect prior to its initiation.
    e. Temporary Construction: Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction as directed by the Architect. Level all temporary roads, parking areas and any other areas that have become compacted or shaped. Any unpaved areas where vehicles are operated shall receive a suitable surface treatment or shall be periodically wetted down to prevent construction operations from producing dust damage and nuisance to persons and property, at no additional cost to the Owner. Keep haul roads clear at all times of any object which creates an unsafe condition. Promptly remove any contaminants or construction materials dropped from construction vehicles. Do not drop mud and debris from construction equipment on public streets. Sweep clean turning areas and pavement entrances as necessary.
3. Water Resources: Investigate and comply with all applicable federal, state and local regulations concerning the discharge (directly or indirectly) of pollutants to the underground and natural waters. Perform all work under this Contract in such a manner that any adverse environmental impacts are reduced to a level that is acceptable to the Architect and regulatory agencies. Refer to Earthwork Section, paragraph on control of water for "dewatering" water disposal requirements.
    a. Oily Substances: At all times, special measures shall be taken to prevent oily or other hazardous substances from entering the ground, drainage areas or local bodies of water in such quantities as to affect normal use, aesthetics or produce a measurable impact upon the areas. Any soil or water which is contaminated with oily substances due to the Contractor's operations shall be disposed of in accordance with applicable regulations.

1.5 SMOKE/ODOR CONTROL

A. Primary fresh air intakes to existing buildings must be protected from exhaust from internal combustion engines, paint and solvent fumes and other noxious fumes and vapors.

B. The Contractor must implement control methods such as snorkels from engines exhausts to 50 feet away from air intakes.

C. All other activities generating fumes must be limited to a distance of at least 50 feet from the air intake grille.

D. If fume generating procedures must occur within 50 feet of an air intake the Contractor is responsible for the following:

1. Notify the Owner Representative at least 14 days in advance.
2. Complete the work when it least impacts the Owner (evenings, weekends, or particularly windy days).
3. Provide carbon filter media, plastic barriers, or other control methods to assure fresh air only enters into the building ventilation system.

1.6 NOISE CONTROL

A. The requirements of the Article are in addition to those of Article 4.02 of the Contract General Conditions.

B. Maximum noise levels within 1,000 feet of any classroom, laboratory, residence, business, adjacent buildings, or other populated area: noise levels for trenchers, pavers, graders and trucks shall not exceed 90 dBA at 50 feet as measured under the noisiest operating conditions. For all other equipment, noise levels shall not exceed 85 dBA at 50 feet.

C. Equipment: Equip jackhammers with exhaust mufflers and steel muffling sleeves. Air compressors should be of a quiet type such as a "whisperized" compressor. Compressor hoods shall be closed while equipment is in operation. Use electrically powered rather than gasoline or diesel powered forklifts. Provide portable noise barriers around jack hammering, barriers constructed of ¾-inch plywood lined with 1-inch thick fiberglass on work side.

D. Operations: keep noisy equipment as far as possible from noise-sensitive site boundaries. Machines should not be left idling. Use electric power in lieu of internal combustion engine power wherever possible. Maintain equipment properly to reduce noise from excessive vibration, faulty mufflers, or other sources. All engines shall have properly functioning mufflers.

E. Scheduling: schedule noisy or potentially disruptive operations so as to minimize their duration at any given location, and to minimize disruption to the adjoining users. Notify the Owner Representative in advance of performing work creating unusual noise and schedule such work at times mutually agreeable. The Owner reserves the right to require performance of any noisy and/or potentially disruptive work during offhours in order to accommodate the Universities operations.

F. Do not play radios, tape recorders, televisions, and other similar items at construction site.

1.7 DUST AND AIR POLLUTION CONTROL

A. The requirements of this Article are in addition to those of the Contract General Conditions.

B. Employ measures to avoid the creation of dust and air pollution.

1. Unpaved areas shall be wetted down, to eliminate dust formation, a minimum of twice a day to reduce particulate matter. When wind velocity exceeds 15 mph, site shall be watered down more frequently.
2. Store all volatile liquids, including fuels or solvents in closed containers.
3. No open burning of debris, lumber or other scrap will be permitted.
4. Properly maintain equipment to reduce gaseous pollutant emissions.

C. Exposed areas, new driveways and sidewalks shall be seeded, treated with soil binders, or paved as soon as possible.

D. Cover stockpiles of soil, sand and other loose materials.

E. Cover trucks hauling soil, debris, sand or other loose materials.

F. Sweep project area streets at least once daily, or more often as required to maintain streets in a clean condition.

G. Appoint a dust control monitor to oversee and implement all measures listed in this Article.

1.8 WELDING AND BURNING

A. Eliminate welding and burning of steel as much as possible. Where unavoidable, perform welding and burning with all possible precaution to avoid fire hazard. Provide a fire watch for minimum of 30 minutes after burning stops. Provide protection for all adjacent surfaces.

1.9 EROSION AND SEDIMENT CONTROL

A. Discharge construction runoff into small drainage's at frequent intervals to avoid build-up of large potentially erosive flows.

B. Prevent runoff from flowing over unprotected slopes.

C. Keep disturbed areas to the minimum necessary for construction.

D. Keep runoff away from disturbed areas during construction.

E. Direct flows over vegetated areas prior to discharge into public storm drainage systems.

F. Trap sediment before it leaves the site, using such techniques as check dams, sediment ponds, or siltation fences.

G. Remove and dispose of all project construction-generated siltation that occurs in offsite retention ponds.

H. Stabilize disturbed areas as quickly as possible.

I. Remove mud from tires of earth moving trucks and equipment before traversing project area streets.

J. Contractor shall commission a Civil Engineer licensed in the State of California to produce a Water Quality Management and Storm Water Pollution Prevention Plan per Section 01 57 23. The plan shall comply with all applicable Code and Agency requirements, and shall govern the protectionary measures to be implemented and maintained by Contractor throughout the construction period. The plan shall be subject to approval by the Owner, and Contractor shall make reasonable revisions as directed by the Owner at no additional cost.

1.10 DISPOSAL OPERATIONS

A. Solid Waste Management: supply solid waste transfer containers. Daily remove all debris such as spent air filters, oil cartridges, cans, bottles, combustibles and litter. Take care to prevent trash and papers from blowing onto adjacent property. Encourage personnel to use refuse containers. Convey contents to a sanitary landfill.

B. Washing of concrete containers where wastewater may reach adjacent property, storm drains or natural watercourses will not be permitted. Remove any excess concrete to the sanitary landfill.

C. Chemical Waste and Hazardous Materials Management: furnish containers for storage of spent chemicals used during construction operations. Dispose of chemicals and hazardous materials in accordance with applicable regulations.

D. Garbage: store garbage in covered containers; pick up daily and dispose of in a sanitary landfill.

E. Dispose of vegetation, weeds, rubble, and other materials removed by the clearing, stripping and grubbing operations off site at a suitable disposal site in accordance with applicable regulations.

F. Excavated Materials:

1. Native soil complying with the requirements of Earthwork Section, may be used for backfill, fill and embankments as allowed by that section.
2. Spoil Material: remove all material that is excavated in excess of that required for backfill, and such excavated material that is unsuitable for backfill, from the site.
    a. Excess suitable backfill material shall be hauled off site. No additional compensation will be paid to the Contractor for such off haul. Include all such costs in the lump sum prices bid for the project.
    b. Unsuitable backfill material will be disposed of off site in accordance with applicable regulations, in a disposal site indicated in the Environmental Protection Plan. Remove rubbish and materials unsuitable for backfill immediately following excavation. Remove material in excess of that required for backfill immediately following backfill operations.

G. Rubbish shall consist of all materials not classified as suitable materials or rubble and shall include shrubbery, trees, timber, trash and garbage.

1.11 CULTURAL RESOURCES

A. The requirements of this article are in addition to those of the Contract General Conditions.

B. The project does not pass through any known archaeological sites. However, it is conceivable that unrecorded archaeological sites could be discovered during construction.

C. In the event that artifacts, human remains, or other cultural resources are discovered during subsurface excavations at locations of the Work, the Contractor shall protect the discovered items, cease work for a distance of 35 feet radius in the area, notify the Architect and comply with applicable law.

D. The Owner may retain an Archaeologist to monitor and recover data and artifacts during period when work has ceased.

E. All items found which are considered to have archaeological significance are the property of the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 57 10

EXISTING FINISH PROTECTION

GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Section specifies the requirements for construction activities impacting the interior and exterior improvements within and adjacent to the construction site. The protection requirements herein are minimum requirements and is/are the contractors responsibility to ensure all aspects of work are protected regardless of the listing within this specification or not. Protection of work is an on-going process whereby the contractor shall adjust, add, change, and replace protection as needed throughout the project to ensure all aspects of work are protected to the greatest possible extent. Section includes but is not limited to the following:

1. Protection of existing finishes within and adjacent to the work area(s).
2. Protection of existing equipment within and adjacent to the work area(s).
3. Protection of completed work.
4. Protection of Building systems, i.e. mechanical, electrical, plumbing utilities and data systems.
5. Protection of ingress and egress pathways.
6. Protection of elevator and lifts.
7. Erection and maintenance of temporary barriers and enclosures.

1.3 CODES AND REGULATIONS

A. California Building Code (CBC): Comply with California Building Code (CBC) Chapter 33, Section 3303, Protection of Pedestrians During Construction or Demolition

B. Fire Regulations: Comply with requirements of fire authorities having jurisdiction, including California Fire Code (CFC) Article 87 during performance of the Work.

C. Safety Regulations: Comply with requirements of all applicable Federal, State and local safety rules and regulations. Contractor shall be solely responsible for jobsite safety.

D. Barricades and Barriers: As required by governing authorities having jurisdiction, provide substantial barriers, guardrails and enclosures around Work areas and adjacent to embankments and excavations for protection of workers and the public.

1.4 PRODUCTS

The following products, or approved equals, shall be used in all locations within new work and/or path of travel to, or within existing work, and/or as directed by the Owner.

A. Plywood / wood Framing – For use for semi-permanent long term temporary closure and opening protection as directed by the Owner. Public facing side shall be painted white.

B. Pro-Tect (www.pro-tect.com) – Floor protection for existing materials and/or newly installed materials.

C. Pro-Tect EZ Prop System (www.pro-tect.com) – Temporary enclosure for dust control to enclosure interior work space within an existing space.

D. Pro-Tect 1-2-3 Door Shield (www.pro-tect.com) – Door and jamb protection for use to protect new or existing doors and frames.

E. Pro-Tect Dust Door with zipper (www.pro-tect.com)

F. Pro-Tect Corner guards (www.pro-tect.com) – for use to protect existing or new finished wall corners.

G. Pro-Tect Tacky Mats (www.pro-tect.com) – for use as walk off mats both inside and outside of new to existing work.

1.5 INTERIOR AND EXTERIOR PROTECTION OF EXISTING IMPROVEMENTS

A. Walking surface protection: Provide non-destructive compatible walking surface protection over all floor finishes remaining in-place during the period of construction

B. Carpeting: Use Pro-Tect brand adhesive plastic sheeting roller over entire surface, PC60-500 (5’ wide) or equal.

C. Wood, Vinyl or Concrete Flooring: Use RAM BOARD or Pro-Tect Hardboard-WR brand floor over entire surface, HARDBOARD-WR or equal.

D. Ingress and egress protection: Provide protection for the surfaces of doors, door frames and outside corners.

E. Door surfaces: Use Pro-Tect brand Door Shield, PTDS.30,.40 or equal.

F. Door Frames: Use Pro-Tect brand FPB Jamb Protector, FPB60 or equal.

G. Corner Guards: Use Pro-Tect brand corner guards, PCCG-1 or equal.

H. Walk-off Mats: Use Pro-Tect brand walk-off mats, PTM-2-3624 or equal.

I. Stairs: Use Pro-Tect brand red rosin paper with painter’s tape, PTRP or equal.

J. Shoe Covers: Use Pro-Tect brand removable shoe covers when traveling inside the construction area to outside the construction area, PBDG or equal.

K. Dust and Dirt reduction and elimination: Provide the entry and exit close off protection to eliminate the spread of construction dust and dirt.

L. Construction Area Entrance: Use Pro-Tect brand Zipper, ZPU-7.25 or equal.

M. Ceiling Protection: Use Pro-Tect brand Clip and Snap connectors to hold plastic sheeting, PTCSB-1 or PTCSR-1 or equal.

N. Provide seal-off and/or HEPA filtering of HVAC system air delivery and exhaust systems. The type and location of protection shall be instituted with the consultation of the Owner facilities maintenance staff's direct input. This protection shall include lighting, HVAC ductwork, audio/visual, laboratory and any other equipment, materials or systems which may be vulnerable to dust and dirt. O. Ductwork Closures: Use Pro-Tect brand Duct Shield, PDS24, 36 or equal.

P. Provide protective coverings over casework, countertops, tables, desk and etc. Countertop/Casework Protection: Use Pro-Tect brand Multi-use Red Film, PMR24, 36, 48 or equal.

Q. Miscellaneous Protection: Provide protective devises and materials to protect fire sprinkler heads, fire alarm devices and the like. Contact the device manufacturer for the correct protective covers for their devices.

R. Fire Alarm Devices: Use Simplex brand dustproof device covers. Owner provided Heat Detectors can replace existing smoke detectors only when approved by the State Fire Marshal.

S. Elevators and accessibility lifts: Provide floor, wall and ceiling protective devices in all vertical circulation systems. Maintain clear access to the controls for these systems. Use protection cab wall blankets where hooks are available. Where cab wall hooks are not available use MDO plywood connected to bump/hand rails and supported from the cab floor. Rails used for connection shall be first individually protected with a cushioned cover wrap.

T. Safe Exiting: All protective measures shall be designed, installed and maintained so they do not interfere with the safe exiting of the area's occupants in an emergency. If lighting systems have been disabled, the Contractor shall install temporary construction lighting sufficient to safely perform the work.

1.6 MAINTENANCE OF CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

A. Maintenance: Use all means necessary to maintain temporary barriers and enclosures in proper and safe condition throughout progress of the Work.

B. Replacement: In the event of loss or damage, promptly restore temporary barriers and enclosures by repair or replacement at no change in the Contract Sum or Contract Time.

1.7 TEMPORARY BARRIERS, ENCLOSURES AND PASSAGEWAYS

A. Temporary Barriers, General: Provide temporary fencing, barriers and guardrails as necessary to provide for public safety, to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

1. Note requirements for continued occupancy and use of existing buildings and site areas during construction
2. Comply with applicable requirements of California Building Code (CBC) and authorities having jurisdiction, including industrial safety regulations. Review requirements with Owner's Representative
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting
4. Paint temporary barriers and enclosures with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard
5. Where appropriate and necessary, provide warning lighting, including flashing red or amber lights

B. Temporary Closures: Provide temporary closures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather-tight enclosure for building exterior
   1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate closures with ventilating and material drying or curing requirements to avoid dangerous conditions and effects such as mold
   2. Vertical openings: Close openings of 25 sq. ft. (2.3 sq. m) or more with plywood or similar materials. Public facing side shall be painted white.
   3. Horizontal openings: Close ALL openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
      a. Any penetration subject to water infiltration shall be made water tight with protective measures until all work is completed.
   4. Install tarpaulins securely using wood framing and other suitable materials
   5. Where opening size exceeds 64 sq. ft. in area, use fire-retardant-treated framing and plywood. Public facing side shall be painted white.

C. Temporary Partitions: Erect and maintain temporary partitions and temporary closures to limit dust and dirt migration, including migration into existing facilities, to separate areas from fumes and noise and to maintain fire-rated separations
   1. Dust Barriers: Construct dustproof, floor-to-ceiling partitions of not less than nominal 4-inch (100mm) studs, 2 layers of 3-mil (0.07-mm) polyethylene sheets, inside and outside temporary enclosure.
      a. Overlap and tape full length of joints
   2. Include 5/8" thick gypsum board at temporary partitions serving as noise barrier
   3. Insulate partitions to minimize noise transmission to adjacent occupied areas
   4. Seal joints and perimeter of temporary partitions

D. Dust barrier passages: Where passage through dust barrier is necessary, provide gasketed doors or heavy plastic sheets that effectively prevent air passage
   1. Construct a vestibule and airlock at each entrance to temporary enclosure with not less than 48" between doors
   2. Maintain water-dampened foot mats in vestibule where passage leads to existing occupied spaces
   3. Equip doors with security locks

E. Fire-rated temporary partitions: Maintain fire-rated separations, including corridor walls and occupancy separations, by construction of stud partitions with gypsum board faces
   1. Construction details shall comply with recognized time-rated fire-resistive construction. Typically, 1-hour rated partitions shall be 2x4 wood studs at 16" on center or 3-1/2" metal studs at 16" on center, with 5/8" thick Type X gypsum board at both faces, with joints filled, taped and topped
   2. Seal partition perimeters with acceptable fire stopping and smoke seal materials

3. Construct fire-rated temporary partitions whenever existing time-rate fire-resistive construction is removed for 12 hours or more.

F. HVAC Protection: Provide dust barriers at HVAC return grilles and air inlets to prevent spread of dust and clogging of filters

G. Temporary Floor Protection: Protect existing floors from soiling and damage
1. Cover floor with 2 layers of 3-mil polyethylene sheets, extending sheets 18" up the side walls
2. Cover polyethylene sheets with ¾" fire-retardant plywood
3. Provide 'sticky' floor mats to clean dust from shoes

H. Security Closures and Lockup: Provide substantial temporary closures of openings in exterior surfaces and interior areas as appropriate to prevent unauthorized entrance, vandalism, theft and similar violations of security. Provide doors with self-closing hardware and locks.

I. Weather Closures: Provide temporary weather-tight closures at exterior openings to prevent intrusion of water, to create acceptable working conditions, to protect completed Work and to maintain temporary heating, cooling and ventilation. Provide access doors with self-closing hardware and locks.

J. Provide temporary lighting, illuminated interior exit signage, non-illuminated directional and instructional signage, and temporary security alarms for temporary exits and exit passageways.

K. Temporary measures shall suit and connect to existing building systems, and shall be approved by Owner's Representative and authorities having jurisdiction.

1.8 PROTECTION OF INSTALLED WORK

A. Protection of Installed Work, General: Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.

C. Protective Coverings: Provide protective coverings at walls, projections, jambs, sills, and soffits of openings as necessary to prevent damage from construction activities, such as coatings applications, and as necessary to prevent other than normal atmospheric soiling.
a. Carpeting: Use Pro-Tect brand adhesive plastic sheeting roller over entire surface, PCD2430 or equal.
b. Wood, Vinyl or Concrete Flooring: Use RAM BOARD or Pro-Tect Hardboard-WR brand floor over entire surface, HARDBOARD-WR or equal. Kraft or Red Rosin Paper is NOT Acceptable.
c. Door surfaces: Use Pro-Tect brand Door Shield, PTDS.30.40 or equal.
d. Door Frames: Use Pro-Tect brand FPB Jamb Protector, FPB60 or equal.
e. Corner Guards: Use Pro-Tect brand corner guards, PCCG-1 or equal.
f. Casework: Cardboard all vertical and horizontal surfaces D. Traffic Protection:
a. Protect finished floors, stairs and other surfaces from traffic, soiling, wear and marring.
b. Temporary covers shall not slip or tear under normal use

1.9 REMOVAL OF TEMPORARY BARRIERS AND ENCLOSURES

A. Removal of Temporary Barriers and Enclosures: Unless otherwise mutually agreed by Owner's Representative and Contractor, remove temporary materials, equipment, services, and construction prior to Contract Completion review.

B. Cleaning and Repairs: Clean and repair damage, soiling and marring caused by installation or use of temporary barriers and enclosures.

END OF SECTION

SECTION 01 57 23

STORMWATER POLLUTION PREVENTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Stormwater General Permit Order WQ 2022-0057-DWQ

B. Stormwater Pollution Prevention Plan (SWPPP)

1.2 SUMMARY

A. The work includes, but is not limited to, the development, implementation, maintenance, reporting, inspection procedures and execution of the project SWPPP, in compliance with the State of California 2022 Construction General Permit.

B. Contractor shall provide all material, labor, and equipment for the development, installation, implementation, and maintenance of all storm water pollution prevention measures. Including conveyance, detention, filtration, and treatment facilities. Scope of work to include:

1. A California certified Qualified SWPPP Developer (QSD) will develop and provide a preliminary SWPPP to the Contractor. Any placeholders shall be reviewed and updated by the Contractor as necessary. Contractor shall pay all costs associated with implementation of the SWPPP.

2. Contractor shall be responsible for hiring or contracting a QSD to provide year-round construction services as required by the 2022 Construction General Permit. A QSD shall:

    a. Be retained from the beginning of the project through Notice of Termination (NOT)

    b. Receive and review weekly reports

    c. Revise the SWPPP (via amendment) to address problems identified by visual inspections, sampling data, QSP observations, etc.

    d. Perform the following on-site visual inspections:

        1) Within 30 days of the start of construction
        2) Within 30 days of a QSD replacement
        3) Once in first quarter (between January and March)
        4) Once in the fall (between August and October)
        5) Within 14 calendar days after a Numeric Action Level exceedance
        6) Within the time period requested in writing by the Water Board

3. Contractor shall be responsible for hiring or contracting for the services of a California certified Qualified SWPPP Practitioner (QSP).

4. Prior to start of construction, the Contractor and QSP shall update the preliminary SWPPP with the necessary documents and submit to the Owner and QSD for review and approval. This may include but is not limited to, a construction activities logistics map, materials used, safety plans, and a contractor and subcontractors list.

5. The QSD will assist with preparing the SWPPP and filing a Notice of Intent (NOI) with the State Water Resources Control Board. The Legally Responsible Peron (LRP) shall then certify and submit the SWPPP in the state-run Stormwater Multiple Application and Report Tracking System (SMARTS).

6. Contractor shall be responsible for providing and implementing all measures of the approved SWPPP, including continuous maintenance throughout the life of the project, especially before, during, and after rain events.

7. Contractor's QSP shall be responsible for all water samples testing required by the SWPPP.

8. Contractor shall modify and amend the SWPPP as necessary based on project conditions, durations, weather and seasonal changes.

9. The minimum compliance basis shall be that of the California General Permit (NPDES) 2022-0057-DWQ.

C. Contractor shall have storm drain pollution prevention measures in place and functioning at all times. The Construction General Permit (CGP) does NOT recognize a rainy season.

D. Contractor shall not allow any non-storm water discharges, including ground water, to enter the storm drain system. Examples of non-storm water discharges include, but are not limited to: domestic supply water used to wash streets, construction materials, tools, equipment and vehicles.

E. Discharges not covered by the Construction General Permit shall have the necessary discharge permits as required per appropriate city, county, or state standard prior to discharge.

F. Related Sections:

1. Section 014100, Regulatory Requirements
2. Section 015700, Temporary Controls
3. Section 015723a, Stormwater Management Monthly Report
4. Section 015200, Construction Facilities
5. Section 017700, Contract Closeout Procedures

1.3 REFERENCES

A. California Stormwater Quality Association – Construction BMP Handbook Portal / SWPPP Template - http://www.casqa.org

B. California Environmental Protection Agency – State Water Resources Control Board - http://www.swrcb.ca.gov

C. National Oceanic and Atmospheric Administration United States Department of Commerce - http://www.noaa.gov

D. Clean Water Act, United States Environmental Protection Agency, and Porter-Cologne Clean Water Act, State of California

E. State Water Resources Control Board Order No. 2022-0057- DWQ, NPDES No. CAS000002 – General Construction Permit
https://www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2022/wqo_2022-0057-dwq.pdf

F. American Public Works Association – Standard Specifications for Public Works Construction (SSPWC), latest edition. Building News Inc. www.bnibooks.com

G. Caltrans Standard Specifications (CSS) – https://dot.ca.gov/programs/design/october-2022-ccs-standard-plans-and-standard-specifications

1.4 SUBMITTALS

A. Contractor shall update the preliminary SWPPP developed by a qualified QSD with the necessary documents as required by the CGP. A copy shall be submitted to the Owner and QSD for review and approval.

B. Shop Drawings and Calculations: Contractor shall provide shop drawings for review and approval that shall depict the location, site, and size, type, and function of all BMP components. Supporting calculations shall be included as necessary to validate sizing and effectiveness of components for the following systems if used:
1. Active treatment systems
2. Pumping systems
3. Filter systems

1.5 DEFINITIONS

A. Active Areas of Construction: All areas undergoing land surface disturbance activities related to the project including, but not limited to, project staging areas, immediate access areas and storage areas. All previously active areas are still considered active until final stabilization is complete.

B. Active Treatment System (ATS): A treatment control BMP that reduces turbidity of the construction site runoff by adding chemicals or using electrical current to enhance flocculation, coagulation and settling of suspended sediment. The two major types of systems are flow through treatment and batch treatment.

C. Best Management Practices (BMPs): Includes schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent, eliminate, or reduce the pollution of water leaving a site. BMPs also include treatment requirements, operating procedures, and practices to control site runoff spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

D. Construction Activity: Includes clearing, grading, excavation, and all Contractor activities that could result in soil disturbance or contribute to water pollution.

E. Dewatering Operations: Practices that manage the discharge of pollutants when water must be removed from a work location to proceed with construction work or to provide vector control.

F. Discharge: A release of flow of storm or non-storm water or other substance from a conveyance system or storage container off-site to a storm drain, flood control channel, etc.

G. Effluent Limitations: Limitations on amounts of pollutants that may be contained in a discharge.

H. Erosion Control: Erosion control is any source control practice that prevents water pollution by protecting the soil surface and preventing soil particles from being detached by rainfall, flowing water, or wind.

I. Construction General Permit (CGP): The National Pollutant Discharge Elimination System (NPDES) permit issued by the California State Water Resources Control Board for the discharge of storm water associated with construction activities from soil disturbance of one acre or more.

J. Gross Pollutants: Visible pollutants such as trash, debris and floatables, which may create an aesthetic "eye sore" in waterways, and heavy metals, pesticides, or bacteria in storm water. Gross pollutants also include plant debris (such as leaves and lawn clippings), animal excrement, street litter, and other organic matter.

K. Hazardous Waste: A waste or combination of wastes that, because of its quantity, concentration, or physical, chemical or infectious characteristic, may either cause or significantly contribute to an increase in mortality or an increase in serious irreversible illness: or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed. Or possess at least one of four characteristics (ignitability, corrosivity, reactivity, or toxicity) or appears on EPA or state lists as hazardous. Hazardous Waste is regulated under the Federal Resource Conservation and Recovery Act and the California Health and Safety Code.

L. High Risk of High pH Discharge: A "high risk of high pH discharge" can occur during utility construction, vertical construction, and during any portion of any construction phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations to the background pH of any discharge.

M. Illicit Discharge: Any discharge to a receiving water that is not in compliance with applicable laws and regulations, e.g. is not discharged pursuant to the applicable NPDES permit.

N. Inactive Areas of Construction: Areas of construction activity that have been disturbed but which are not currently being worked and are not scheduled to be re-disturbed for at least 14 days.

O. Legally Responsible Person (LRP): The person possessing the title of the land on which the construction activities will occur. When ownership is by a corporation or public agency, the LRP is the appropriate corporate officer of public official as defined in the General Permit.

P. Municipal Separate Storm Sewer System (MS4): A conveyance or system of conveyances; including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, channels or storm drains: (i) designed or used for collecting or conveying storm water;(ii) which is

not a combined sewer; and (iii) which is not part of a Publicly Owned Treatment Works (POTW) as defined at Title 40 of the Code of Federal Regulations (CFR) 122.2.

Q. Non-Storm water Discharge: Any discharge to a MS4 or receiving water that is not composed entirely of storm water.

R. Non-Point Sources Pollution: Pollution that originates from diffuse contamination that does not originate from a single discrete source and specifically does not come from a point source as defined by the Clean Water Act. Non-point surface pollution can originate from aerial diffuse sources, agriculture, forests, and irrigation runoff.

S. Notice of Intent (NOI): Part of the required Permit Registration Documents, which provides information on the owner, location, type of project, and verifies that the owner will comply with the conditions of the Construction General Permit.

T. Notice of Termination (NOT): Formal notice to SWRCB submitted by owner/developer that a construction project is complete and the project has met the conditions to terminate the permit.

U. NPDES Permit: NPDES is an acronym for National Pollutant Discharge Elimination System. NPDES is the national program for administering and regulating Sections 307,318, 402, and 405 of the CWA. In California, the State Water resources Control Board (SWRCB) has issued a General Permit for storm water discharges associated with construction activities.

V. Numeric Action Level (NAL): An allowable range or threshold for a particular water quality measurement to gauge the performance of the measures or practices used at a site to minimize the discharge of pollutants. The NAL is used to determine if it is necessary to take corrective action. The general Permit includes NALs for pH and turbidity; however these action levels are not directly enforceable.

W. Numeric Effluent Limitation (NEL): A technology-based or water-quality based limit (pH, turbidity, or concentration) established for discharges covered under the CGP. The numeric effluent limitation compliance locations apply to each sample and/or discharge location at the point of discharge from an active treatment system if applicable.

X. Permit Registration Documents (PRD): A set of documents that serve as the formal notice to SWRCB, submitted by the owner of a construction site, that says said owner seeks coverage under the Construction General Permit for discharges associated with construction activities.

Y. Point Source: Any discernible, confined, and discrete conveyance from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agriculture storm water runoff.

Z. Precipitation: Any form of rain or snow.

AA. Qualified SWPPP Developer (QSD): Individual who is authorized to develop and revise SWPPPs.

BB. Qualified SWPPP Practitioner (QSP): Individual assigned responsibility for the implementation of all elements of the SWPPP, including non-storm water and storm water visual observations, sampling and analysis, and preparation of Rain Event Action Plans.

CC. Qualifying Storm or Rain Event: Any event that produces 0.5 inches or more precipitation within a 48 hour or greater period between rain events.

DD. Rain Event Action Plan (REAP): Written document, specific for each rain event, that when implemented is designated to protect all exposed portions of the site within 48 hours of any likely precipitation event. REAPs are prepared by the QSP based on the predicted rain event and construction activities.

EE. Receiving water: A storm drainage system, channel, river, lake, stream, estuary, bay, or ocean into which runoff is discharged.

FF. Rolled Erosion Control Products (RECPs): Prefabricated product such as mulch-control nets, open-weave geotextiles, and erosion-control blankets. Typically manufactured from wood excelsior, straw, jute, coir, polyolefins, PVC and nylon. Designed to control erosion and assist in establishment of vegetation.

GG. Runoff: Water originating from rainfall, melted snow, and other sources (e.g., sprinkler irrigation) that flows over the land surface to drainage facilities, rivers, streams, lakes, and wetlands.

HH. Run-on: Off-site storm water or other surface flow that flows onto a project site.

II. Significant Materials: Includes materials such as; fuels; solvents, detergents, and plastic pellets; finished materials such as metallic products; materials used in food processing or production; hazardous substances designed under Section 313 of Title III of SARA; fertilizers; pesticides; and waste products such as ashes, slag, and sludge that have the potential to be released with storm and non-storm water discharges.

JJ. Significant Quantities: The volume, concentrations, or mass of a pollutant in storm water discharge that can cause or threaten to cause pollution, contamination, or a nuisance that adversely impact human health or the environment and causes or contributes to a violation of the EPA Clean Water Act.

KK. Storm Water: Defined as runoff and snowmelt runoff consisting only of those discharges, which originate from precipitation events. Storm water is that portion of precipitation that flows across a surface to the storm drain system or receiving waters.

LL. Storm Water Multiple Application and Report Tracking System (SMARTS) - SMARTS has been developed by the SWRCB to provide an online tool to assist dischargers in submitting their Permit Registration Documents (PRD), No Exposure Certification (NEC) if applicable, NOTs and Annual Reports, as well as viewing and printing receipts of fee payments, monitoring the status of submitted documents, and viewing application and renewal fee statements.

MM. Storm Water Pollution Prevention Plan (SWPPP): A written plan that documents the series of phases and activities that characterizes the project site and describes the necessary actions to implement to prevent the pollution of storm and non-storm water discharges during construction.

NN. Storm Drainage System – In this document, the term "storm drainage system" shall include storm water conduits, storm drain inlets and other storm drain structures, gutters, channels, water courses, creeks and lakes.

OO. Traditional Construction Project: Most construction projects, including but not limited to commercial, residential, industrial, educational, and roadway construction projects. Does not included those projects defined as Linear Underground Projects (LUPs) in the CGP.

PP. Waste Management: Source control management practices that prevent pollution by limiting or reducing potential waste pollutants at their source, before they come into contact with storm or non-storm water. Practices under this category are "good housekeeping" and include procedural and structural BMPs for handing, storing, and disposing of waste generated by the construction project.

QQ. Wind Erosion Control: Methods used to minimize wind erosion. Controls consist of covering or applying water or other dust palliatives to prevent and alleviate dust nuisance.

RR. Construction Site Stormwater Manager (CSSM): Contractor's designated staff person or sub-Contractor with the responsibility of managing the implementation of the SWPPP on the project site. The CSSM shall have the authority to direct work on the job site as necessary to maintain compliance with the SWPPP program. CSSM shall be a Qualified SWPPP Practitioner (QSP).

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Materials, Equipment and Procedures suitable for SWPPP implementation.

1. Contractor to update and maintain the approved SWPPP throughout duration of any construction activities. Contractor shall provide a descriptive project site drawing depicting all BMPs for: run-on and run-off controls and good housekeeping measures, as well as storm and non-storm water control measures that will be used on the site. All erosion and sediment control BMP measures shall be listed in the project SWPPP and indicated on the water pollution control plan. SWPPP shall include water sampling criteria as required.

2. Rolled Erosion Control Products (RECPs): Use degradable erosion control blanket appropriate for required protection duration.

a. Mulch Control netting: A planar woven natural fiber or extruded geosynthetic mesh used as a temporary degradable rolled erosion control product to anchor loose fiber mulches.

b. Open weave textile: A temporary degradable rolled erosion control product composed of processed natural or polymer yarns woven into a matrix, used to provide erosion control and facilitate vegetation establishment.
c. Erosion control blanket: A temporary degradable rolled erosion control product composed of processed natural or polymer fibers mechanically, structurally or chemically bound together to form a continuous matrix to provide erosion control and facilitate vegetation establishment.

B. Straw Wattle/Fiber Rolls: A pre-manufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within photodegradable plastic or biodegradable jute, sisal, or coir fiber netting.

1. Netting: shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 8 inches and 12 inches in diameter. Rolls between 8 inches and 10 inches in diameter shall have a minimum weight of 1 pound per linear foot and a minimum length of 20 feet. Rolls between 10 inches and 12 inches in diameter shall have a minimum weight of 3 pounds per linear foot and a minimum length of 10 feet.

2. Stakes: Wood stakes shall be a minimum of 1" x 2" x 24". Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects, which would render them, unfit for the purpose intended. Metal stakes shall not be used.

3. Rope: Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of ¼ inch.

C. Flocculent: Chemical added to a fluid to promote the coagulation and sedimentation of suspended material in the Automatic Treatment System (ATS) if required

1. Must be Chitosan or approved equivalent.

2. Jar tests shall be conducted using water samples selected to represent typical site conditions and in accordance with ASTM D2035-08 (2003)

3. The discharger shall conduct, at minimum, six site-specific jar tests for each project to determine the proper polymer and dosage levels for the ATS.

D. Filter Fabric: Shall comply with SSPWC Section 213 - Engineering Fabric, of Standard Specifications.

E. Hydroseed Mix: Shall consist of seed, tackifier, and mulch. Mix shall comply with SSPWC Section 308-4.9 Erosion Control Planting.

1. Seed: The species and application rates of grass, legume, and cover-crop seed furnished shall be as stipulated herein.

a. Seed shall be furnished separately or in mixtures in standard containers with the seed name, lot number, net weight, percentages of purity and of germination and hard

seed, and percentage of maximum weed seed content clearly marked for each kind of seed.

b. The Contractor shall furnish the Architect (1) one signed copy and the Owner (1) signed copy of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within 6 months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed.

c. Seeds shall be applied as follows:

LBs/AC	Species/Common Name
7	Vulpia microsttachys, Small fescue
2	Vulpia octoflora, Six weeks fescue

2. Fertilizer: Must be a pelleted or granular form and must be one of the following:

Organic Fertilizer Products	**Guaranteed Chemical Analysis (N-P-K) (%)**	**Company**
Biosol Mix – Granular	7-2-3	Rocky Mountains Bioproducts Edwards, CO
Fertil-Fibers	6-4-1	Quattro Environmental Coronado, CA
Sustane	5-2-4	Natural Fertilizer of America Cannon Falls, MN
Approved Equal[1]	(N) 5 to 7 (P) 1 to 5 (K) 2 to 10	

[1]Approved equal must be within the ranges shown for N-P-K. The cumulative (N) release rate must be no more than 70 percent the first 70 days after incubation (86˚ F) with 100 percent at 350 days or more.

3. Straw: Shall comply with CSS Sections 13 and 21 of Standard Specifications

4. Tackifier: Shall be plant-based and applied at an appropriate rate and ratio as indicated by the manufacturer.

   a. Guar (Plant based)

   b. Psyllium (Plant based)

   c. Starch (Plant based)

5. Fiber: Shall be free from lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, chlorine bleach, and synthetic or plastic materials. Fiber shall be, at most, 7 percent ash. Fiber shall be one of the following products:

a. Wood: shall comply with the following:

1) Long strand, whole wood fibers, thermo-mechanically processed from clean, whole wood chips
2) Not made from sawdust, cardboard, paper or paper byproducts
3) At least 25 percent of fibers 3/8 inch long
4) At least 40 percent held on a No. 25 sieve

b. Cellulose: shall be made from natural or recycled pulp fiber, such as wood chips, sawdust, newsprint, chipboard, corrugated cardboard, or a combination of these materials.

c. Alternate: shall comply with the following:

1) Long strand, whole natural fibers made from clean straw, cotton, corn, or other natural feed stock.
2) At least 25 percent of fibers 3/8 inch long
3) At least 40 percent held on a No. 25 sieve

d. A combination of wood, cellulose, or alternate

6. Coloring Agent: Use a biodegradable, nontoxic coloring agent free from copper, mercury, and arsenic.

F. Mulch: Mulch shall comply with SSPWC Section 212-1.2.5 Mulch and shall be, tree bark, wood chips, shredded bark, or a combination of thereof at the Contractor's option.

G. Silt Fencing Fabric: Geosynthetic fabric for temporary silt fence shall consist of one of the following:

1. Polyester, Polypropylene, Combined polyester and polypropylene fabric:

Property	**ASTM Designation**	**Specification**	
		Woven	**Nonwoven**
Grab breaking load 1-inch grip, lb, min. in each direction	D 4632	120	120
Apparent elongation Percent, min., in each direction	D 4632	15	50
Water Flow Rate Max, average roll value, gallons per minute/square feet	D 4491	10-50	100-150
Permittivity 1/sec., min.	D 4491	0.05	0.05
Apparent opening size Max. average roll value, US Standard Sieve size	D 4751	30	.0
Ultraviolet Degradation percent of original unexposed Grab breaking load 500 hr, minimum	D 4595	70	

a. Sample under ASTM D 4354, Procedure C.

b. Test under ASTM D 4759. All properties shall be based on Minimum Average Roll Value (MARV).

c. Identify, store, and handle under ASTM D 4873.

2. Protect geosynthetics from moisture, sunlight, and damage during shipping and storage. Label each unit with the manufacturer's name, identifying information, and product identification.

3. Posts: must be wood or steel

a. Wood posts must be:

1) Untreated fir, redwood, cedar, or pine and cut from sound timber
2) Straight and free of loose or unsound knots and other defects that would render the stakes unfit for use
3) Pointed on the end to be driven into the ground
4) At least 2"x2" in size, and 4 feet long

b. Steel posts must:

1) Have a "U", "T", "L", or other cross-sectional shape that can resist failure from lateral loads
2) Be pointed on the end to be driven into the ground
3) Weigh at least 0.75-pound per foot
4) Be at least 4 feet long
5) Have a safety cap attached to the exposed end. The safety cap must be orange or red plastic and fit snugly to the metal post

H. Inlet Protection:

1. Sediment filter bag:

a. Must be made of fabric

b. Must be sized to fit the catch basin or drainage inlet

c. Must include a high-flow bypass

d. May include a metal frame, sediment bags that do not have a metal frame and are deeper than 18 inches must:

1) Include lifting loops and dump straps

2) Include a restraint cord to keep the sides of the bag away from the walls of the catch basin

2. Gravel-filled bag fabric must:

a. Be made from fabric

b. Have inside dimensions from 24 to 32 inches in length, and from 16 to 20 inches in width

c. Have the opening bound to retain the gravel. The opening must be sewn with yarn, bound with wire, or secured with a closure device

d. Weigh from 30 to 50 pounds when filled with gravel

3. Gravel for gravel-filled bags must be:

a. From 3/8 inch to ¾ inch in diameter

b. Clean and free from clay balls, organic matter, and other deleterious material

I. Soil Binders:

1. The soil binder must be:

a. Nonflammable

b. Nontoxic to aquatic organisms

c. Free from growth or germination inhibiting factors

d. A plant-based product

2. Soil binder classified as a plant-based product must be:

a. A natural high molecular weight polysaccharide

b. A high viscosity hydrocolloid that is miscible in water

c. Functional for at least 180 days

d. Labeled as either guar, psyllium, or starch

3. Guar must be:

a. A guar gum-based product derived from the ground endosperm of the guar plant, Cyannmopsis tetragonolobus

b. Treated with dispersant agents for easy mixing

c. Able to be diluted at the rate of 1 to 5 pounds per 100 gallons of water

4. Psyllium must be:

a. Made of finely ground muciloid coating of Plantago ovata or Plantago isphaghula seeds

b. Able to dry and form a firm but re-wettable membrane

5. Starch must be a non-ionic, water-soluble granular material derived from corn, potato, or other plant-based source.

6. Coloring agent: use a biodegradable, nontoxic coloring agent free from copper, mercury and arsenic to ensure the hydraulic mulch contrasts with the application area.

PART 3 - EXECUTION

3.1 ROLES AND RESPONSIBILITIES

A. General: During the Construction and Closeout phases of the project the Contractor is responsible for all of the duties identified in the project SWPPP, including overall compliance with the SWPPP and CGP, and the physical implementation and maintenance of all site BMPs.

B. Contractor shall update the preliminary SWPPP provided by the QSD to include necessary documents and submit to the Owner and QSD for review and approval.

C. Pre-Construction

1. General: The Contractor shall participate in meetings, training sessions, and coordination efforts with the owner to refine the project SWPPP and define communication protocols.

2. Construction Site Stormwater Manager: The Contractor shall designate a single qualified person to be the project Construction Site Stormwater Manager (CSSM). This person shall be on-site during work hours and shall be available to address construction stormwater concerns. A backup CSSM shall be designated to perform the duties of the CSSM in the event they are unable to do so or not reachable during an emergency.

3. Training: Both the CSSM and their designated back-up shall be a QSP prior to the start of construction, and maintain certification for the project duration.

4. Coordination of project SWPPP: The Contractor is responsible for participating in the coordination of the SWPPP. This shall include but is not limited to the following.

a. Attend a pre-construction meeting with the owner to present the site logistics plan for all phases of the project and discuss how BMPs will be integrated to the plan. Prime Contractor is responsible to provide SWPPP amendments as required. Amendments must be prepared by a Qualified SWPPP Developer (QSD).

D. Construction Phase

1. Daily Tasks: The CSSM shall be responsible for performing the following daily tasks.

a. Check daily weather forecast on NOAA site for greater than 50 percent likely hood of rainfall.

b. Maintain the sub-contractor log.

c. Provide copies of BMP information to sub-contractors regarding implementation around their areas of work.

d. Perform visual inspection of the site and all installed BMPs.

e. Make corrections to faulty or poorly performing BMPs within 24 hours.

f. Contractor shall post and maintain a copy of the BMPs in their project office.

g. A hard copy of the SWPPP document must be kept on-site at all times. In the event there is not an onsite field office, the binder shall be kept in the CSSM's vehicle and be onsite during work hours.

2. Event-Specific Tasks: The CSSM shall be responsible for performing the following tasks based on a specific event. For each event the CSSM shall report and implement the necessary measures within 24 hours unless noted otherwise.

a. Rain Event Action Plan (REAP): For Risk Levels 1, 2 or 3 projects as defined in the SWPPP, when the CSSM determines there is a greater than 50 percent likelihood of rainfall per the NOAA forecast, the CSSM shall prepare and implement a REAP.

b. BMP Maintenance: When a visual inspection or deficiency notice identifies that a site BMP is damaged, improperly installed, or otherwise in need of repair the Contractor shall be responsible for ensuring the BMP is repaired within 24 hours.

c. Non-Stormwater Run-off Reporting: In the event of a spill or release of material that may cause non-storm water runoff, all Contractors and sub-Contractors employees are responsible for immediately notifying the CSSM and containing the spill for clean-up, removal, and required analysis.

d. The Contractor shall provide, operate and maintain any and all storm water conveyance, detention, and or treatment facilities required to meet the CGP Risk Level Requirements appropriate for the project.

3. Periodic Tasks: The CSSM shall be responsible for performing the following tasks as necessary during the course of construction.

a. BMP Maintenance: As needed for the project duration.

b. Annual Report: Assist and coordinate with owner to fulfill annual reporting requirements. Submit all records and documentation requested by the SMARTS system and the CGP.

4. At all qualifying Rain Events the QSP shall take samples in accordance with the SWPPP and the CGP.

E. SWPPP Closeout Phase

1. The Contractor shall ensure that all temporary BMPs, equipment, and construction materials have been removed from the project site

2. The Contractor shall ensure that all permanent planting and landscaping has been installed and established and prepare documentation to demonstrate the minimum 70-percent coverage has been established.

3. The Contractor shall ensure that all permanent post-construction BMPs have been installed.

F. Contractor Transition: Where the project site will continue under the current approved SWPPP, however responsibility will transition to a different Contractor:

1. The Contractor shall leave the site in a condition acceptable to both the owner and the incoming Contractor.

2. The CSSM shall walk the site with the incoming Contractor no less than two weeks prior to the planned transition of job site responsibility. At that time the condition of all BMPs will be reviewed and those requiring repair and/or replacement identified. The Contractor shall perform all identified repair and/or replacement prior to the transition of site responsibility.

3. A Change of Information (COI) shall be certified and submitted by the LRP to the SWRCB.

3.2 BEST MANAGEMENT PRACTICES (BMPs) INSTALLATION AND IMPLEMENTATION:

For each applicable section below, the Contractor shall delineate the items on the site map.

A. Areas of Disturbed Soil - Contractor shall clearly identify on the site map all areas of soil disturbance. These areas shall include soil removal or augmentation, such as holes, pits, excavations, trenches, berms, slopes, fill, and imported top soil.

B. Areas of Existing Vegetation - Contractor shall protect existing vegetation that is to be preserved on the site from mechanical or other injury during the project. Areas of existing vegetation shall be clearly delineated on the site map.

C. Dust Suppression-Water Management - Contractor shall use best available dust suppression equipment and methods to control dust so that the dust does not cause discomfort or nuisance to occupants of the project site neighboring property. Contractor shall control dust suppression water so that it is effective in controlling dust, but does not enter the storm drain system.

D. De-Watering and Sediment Management - Ground water encountered in excavations is not covered under the CGP. Removal and discharge of ground water must be handled with separate permit. If groundwater is encountered on the project site the Contractor shall stop all construction activities in the immediate area and notify the Owner Representative and Project Architect before proceeding. The Contractor is required to contact the local sanitary sewer and/or storm water agency for discharge requirements and prohibitions. Storm water in excavations that has not mixed with ground water is covered by the CGP. Water quality must comply with discharge regulations.

E. Site Ingress and Egress Tracking Prevention - The Contractor shall ensure that soil is not tracked off the project site or onto public or Park rights of way.

F. Storm Drain Inlet Protection - The Contractor shall protect storm drain inlets from receiving sediment, hazardous chemicals, gasoline, diesel, oil or grease, trash, debris or other pollutants from the construction site.

G. Construction Materials Storage - The Contractor shall cover and berm around materials that could contribute storm water pollution.

H. Concrete, Mortar, Sawcutting - Concrete, Mortar, and Sawcutting: Proper procedures for concrete, mortar, and sawcutting activities are designed to prevent these materials from coming into contact with storm water flows and raising or lowering pH to levels outside the acceptable range. Concrete, mortar, and sawcutting also create potential problems for air pollution, and deliver and storage. Refer to 2023 CASQA Handbook, WM-1 “Concrete Waste Management”, WM-3 “Stockpile Management”, and WM-8 “Concrete Waste Management” for proper procedures and practices.

I. Vehicle and Equipment cleaning, fueling, and maintenance

1. Vehicle and Equipment Cleaning: Proper vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to storm water from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures. Refer to 2023 CASQA Handbook, NS-8 “Vehicle and Equipment Cleaning” for proper procedures and practices.

2. Vehicle and Equipment Fueling: Vehicle Equipment fueling procedures and practices are designated to prevent fuel spills and leaks, and reduce or eliminate contamination of storm water. This can be done by using offsite facilities, fueling in designated areas only, enclosed or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures. Refer to 2023 CASQA Handbook, NS-9 “Vehicle and Equipment Fueling” for proper procedures and practices.

3. Vehicle and Equipment Maintenance: Proper vehicle and Equipment Maintenance procedures and practices are designed to prevent or reduce the contamination of storm water resulting from vehicle and equipment maintenance by running a “dry and clean site” The best option would be to perform maintenance activities at an offsite facility. If his option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures. Refer to 2023 CASQA Handbook, NS-10 “Vehicle and Equipment Maintenance” for proper procedures and practices.

J. Spill Prevention and Control: Proper spill Prevention and Control procedures and practices are designed to prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees. Refer to 2023 CASQA Handbook, WM-10 “Spill Prevention and Control” for proper procedures and practices. WM-1 “Materials Delivery and Storage”, and WM-2 “Material Use”, also contain useful information on spill prevention.

K. Rolled Erosion Control Products (RECPs)

1. General procedure: prepare a stable and firm soil surface free of rocks and other obstructions. Apply soil amendments as necessary to prepare seedbed. Place fertilizer,

water, and seed in accordance with manufacturer, local/state regulations, or engineer/specifiers requirements. Typically, RECPs are unrolled parallel to the primary direction of flow. Endure the product maintains intimate contact with the soil surface over the entirety of the installation. Do not stretch or allow material to bridge over surface inconsistencies. Staple/stake RECPs to the soil such that each staple/stake is flush with the underlying soil. Install anchor trenches, seams and terminal ends as specified. Install RECPs after application of seed, fertilizer, mulches (if necessary) and other necessary soil amendments.

2. Installation: Anchor Trenches, Seams and Terminal Ends: Utilize one of the methods below for initial anchoring of Upslope Anchor RECPs

    a. Staples: Install the RECPs 3 ft (900 mm) beyond the shoulder of the slopes onto flat final grade. Secure roll ends with a single row of stakes/stales on 1 ft (300 mm) centers.

    b. Anchor trench: Excavate a 6 in. by 6 in. (150 mm by 150 mm) anchor trench. Extend the upslope terminal end of the RECPs 3 ft. (900 mm) past the anchor trench. Use stakes or staples to fasten the produce into the bottom of the anchor trench on the 1 ft. (300 mm) centers. Backfill the trench and compact the soil into the anchor trench. Apply seed and any necessary soil amendments to the compacted soil and cover with remaining 1 ft. (300 mm) terminal end of the RECPs. Fold product over compacted soil in anchor trench to overlap downslope material.

    c. Staple Check: Construct a stake/staple check slot along the top edge of the RECPs by installing two rows of staggered stakes/staples 4 in. (100 mm) apart on 4 in. (100 mm) centers.

    d. Single net product anchor trench: Excavate a 6 in. by 6 in. (150 mm by 150 mm) anchor trench. Position roll such that the leading end of the roll is downslope and upside down. Apply seed and necessary soil amendments. Extend product 1 ft. downslope of anchor trench and place material in anchor trench (upside down). Secure terminal end and material in anchor trench with staples at 1 ft. intervals. Fill anchor trench with soil and compact. Apply seed and necessary soil amendments to fill placed in anchor trench. Move remaining roll over and downslope of anchor trench and proceed unrolling RECP downslope (since roll was initially reversed, folding material over anchor trench will result in the net side up, and rolling correctly downslope over the anchor trench).

3. Seams – utilize one of the methods below for seaming of RECPs

    a. Adjacent seams: Overlap edges of adjacent RECPs by 2 to 4 in. (50 to 100 mm) or by abutting products as defined by manufacturer. Use a sufficient number of stakes or staples to prevent seam or abutted rolls from separating.

    b. Consecutive seams: Shingle and overlap consecutive rolls 2 to 6 in. (50 to 150 mm) in the direction of flow. Secure staples through seam at 1 ft. (300 mm) intervals.

c. Check seam: Construct a stake/staple check seam along the top edge of RECPs for slope application and at specified intervals in a channel by installing two staggered rows of stakes/staples 4 in. (100 mm) apart on 4 in. (100 mm) centers.

d. Slope interruption check slot: excavate a trench measuring 6 in. wide by 6 in. deep (150 mm by 150 mm). Secure produce to the bottom of the trench. Fold product over upslope material and fill and compact the trench on the downslope side of check slot and seed fill. Continue rolling material downslope over trench.

4. Terminal ends – utilize one of the methods below for all terminal ends of RECPs

a. Staples: Install the RECPS 3 ft. (900 mm) beyond the end of the channel and secure end with a single row of stakes/staples on 1 ft. (300 mm) centers. Stakes/staples for securing RECPS to the soil are typically 6 in (150 mm) long.

b. Anchor trench: Excavate a 6 in. by 6 in. (150 mm by 150 mm) anchor trench. Extend the terminal end of the RECPs 3 ft. (900 mm) past the anchor trench. Use stakes or stapes to fasten the product into the bottom of the anchor trench. Apply seed and any necessary soil amendments to the compacted soil and cover with remaining 1 ft. (300 mm) terminal end of the RECPs. Secure terminal end of RECPs with a single row of stakes or staples on 1 ft. (300 mm) centers.

c. Check slot: Construct a stake/staple check slot along the terminal end of the RECPs by installing two rows of staggered stakes/staples 4 in. (100 mm) apart on 4 in. (100 mm) centers.

1) Slope installations: At the top of slope, anchor the RECPs according to one of the methods detailed above. Securely fasten all RECPs to the soil by installing stakes/staples at a minimum rate of $1.3/yd^2$ ($1.5/m^2$) within the body of the blanket. For the most effective RECP installation use stake/staple patterns and densities as recommended by manufacturer. For adjacent and consecutive rolls of RECPs follow seaming instructions detailed above. The terminal end of the RECPs installation must be anchored using one of the methods detailed above.

d. Recommended maximum gradient for RECPs slope applications:

1) Mulch Control Nets: 5:1(H:V)
2) Netless Rolled Erosion Control Blankets: 4:1 (H:V)
3) Single-net Erosion Control Blankets & Open Weave Textiles: 3:1 (H:V)
4) Double-net Erosion Control Blankets: 2:1 (H:V)

5. Straw Wattle/Fiber Rolls Installation:

a. Fiber rolls: Rope and notched stakes shall be used to restrain the fiber rolls against the slope. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the fiber roll tightly to the slope. Furrows will not be required.

b. Fiber rolls shall be placed 10 feet apart along the slope for slope inclination (horizontal: vertical) of 2:1 and steeper, 15 feet apart along the slope for slope inclination between 2:1 and 4:1, 20 feet apart along the slope for slope inclination between 4:1 and 10:1, and a maximum of 50 feet apart along the slope for slope inclination of 10:1 and flatter.

c. The bedding area for the fiber rolls shall be cleared of obstructions including rocks, clods, and debris greater than one inch in diameter before installation.

d. If cross slope drainage is desired, replace the following with "The installed angle of the fiber roll to the slope contour shall create a 2 percent to 5 percent grade from the center of the slope to the slope conform at the limit of disturbance." The limit of disturbance refers to the edge of a disturbed soil area (DSA) created by grading, vegetation removal, etc. Edit as needed.

e. Fiber rolls shall be installed approximately parallel to the slope contour.

f. If the intended function of the fiber rolls to disperse concentrated water runoff and to reduce runoff velocities is impaired, the Contractor shall take action to repair or replace the fiber rolls. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

L. Filter Fabric: Shall comply with SSPWC Section 213 – Engineering Fabric", of Standard Specifications.

M. Silt Fence Installation: Silt fence must be:

1. Constructed with silt fence fabric, posts, and fasteners.

2. Prefabricated or assembled at the job site

3. Attached to posts using these methods:

a. If prefabricated silt fence is used, posts must be inserted into sewn pockets

b. If assembled on the job site:

1) If wood posts are used, fasteners must be staples or nails
2) If steel posts are used, fasteners must be tie wires or locking plastic fasteners
3) Spacing of the fasteners must be no more than 8 inches apart

4. Installation:

a. Placing the bottom of the fabric in a trench that is at least 6 inches deep

b. Securing with posts placed on the downhill side of fabric

c. Backfilling the trench with soil and hand or mechanically tamping to secure the fabric in the trench

d. Silt fence sections connected by:

1) Joining separate sections of silt fence to form reaches that are no more than 500 feet long
2) Securing the end posts of each section by wrapping the tops of the posts with at least two wraps of 16-gage diameter tie wire
3) Ensuring that each reach is a continuous run of silt fence from an end to an opening, including joined panels
4) Place silt fence approximately parallel to the slope contour. For any 50 foot section of silt fence, do not allow the elevation at the base of the fence to vary more than 1/3 of the fence height.
5) If you mechanically push the silt fence fabric vertically through the soil, you must demonstrate that the silt fence fabric will not be damaged and will not slip out of the soil, resulting in sediment passing under the silt fence fabric.
6) If you reinforce the silt fence fabric with wire or plastic mesh, you may increase the post spacing to a maximum of 10 feet. The field-assembled reinforced silt fence must be able to retain saturated sediment without collapsing.

5. Maintenance: Maintain temporary silt fence to provide sediment holding capacity and to reduce runoff velocities by:

a. Removing sediment from behind the silt fence when sediment is 1/3 the height of the silt fence above ground.

b. Repairing or adjusting the silt fence when rills and other evidence of concentrated runoff occur beneath the silt fence fabric

c. Repairing or replacing the silt fence fabric when it becomes split, torn, or unraveled within 24 hours of discovering damage unless engineer approves a longer period

d. Removing sediment deposits, trash, and debris from temporary silt fence as needed or when directed by the Architect. If removed sediment is deposited within project limits, it must be stabilized and not subject to erosion by wind or water. Trash and debris must be removed and disposed of properly.

N. Hydroseed:

1. The quantity of tackifier in the mixture shall be as recommended by the manufacturer.

2. The ratio of water to fiber and tackifier in the mixture shall be as recommended by the manufacturer. The proportions of various erosion control materials may be changed by the Architect to meet field conditions. Use hydroseeding equipment to apply hydroseed.

3. Apply hydroseed:

a. At application rate recommended by manufacturer. Successive applications or passes may be needed to achieve the recommended rate:

1) To form a continuous mat with no gaps between the mat and the soil surface
2) From 2 or more directions to achieve a continuous mat
3) In layers to avoid slumping and to aid drying

b. During dry weather or at least 24 hours before predicted rain

c. The ratio of total water to total tackifier in the mixture shall be as recommended by the manufacturer.

d. Seed may be dry applied at the rate recommended by the manufacturer for small areas not accessible by the hydroseeding equipment, when approved in writing by the Architect. Dry applied seed shall be incorporated into the soil a maximum depth of 1/4 inch by raking or dragging.

e. Hydraulic application of erosion control (Hydroseed) materials for rolled erosion control product (Netting) areas shall be applied by hose, from the ground. Erosion control (Hydroseed) materials must be applied onto the slope face such that the materials are well integrated into the rolled erosion control product (Netting) and in contact with ground surface. Application must be perpendicular to the slope face such that rolled erosion control product (Netting) materials are not damaged or displaced. Complete tackifier application on the same day as straw work began for that area.

f. The CSSM may change the application rates of erosion control (Hydroseed) materials to meet field conditions.

g. For any area where erosion control (Hydroseed) materials are to be applied, the application of all erosion control (Hydroseed) materials to be applied to that area must be completed within 72 hours from when the first materials were applied.

h. Immediately after the application of the hydroseed, sprinklers shall be operated just long enough to wash excess material from previously planted materials and site features. Care shall be taken to avoid washing or eroding materials from area.

i. Follow-up applications shall be made as needed to cover weak spots and to maintain adequate soil protection.

j. Contractor shall provide regular irrigation as required until hydroseeding is well established. Contractor shall review in the field with the SWMR to determine when irrigation can cease.

O. Mulch: Spread mulch to a uniform thickness. Extend mulch to the edge of retaining walls, dikes, paving and to within 4 feet from the flow line of paved and unpaved drainage ditches.

P. Inlet Protection: Install per manufacturers recommendations and maintain as required based on field conditions and inspections.

Q. Soil Binders:

1. Apply soil binder:

   a. Per the manufacturer's recommendations for the job site soil conditions. Pre-wet the area if recommended by the manufacturer.

   b. From 2 or more directions to achieve a continuous cover.

   c. During dry weather at least 24 hours before predicted rain.

2. Do not apply soil binder if:

   a. Water is standing on or moving across the soil surface

   b. Soil is frozen

   c. Air temperature is below 40 ºF during the tackifier-curing period unless allowed by the manufacturer and approved by the engineer. Note: Do not over-spray soil binder onto the traveled way, sidewalks, lined drainage channels, or existing vegetation.

3. Maintenance:

   a. Reapply soil binder within 24 hours of discovering visible erosion, unless the Architect approves a longer period.

   b. Temporary soil binder disturbed or displaced by the Contractor's vehicles, equipment, or operations must be reapplied at the Contractor's expense.

END OF SECTION – 015723

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. General requirements for products used for the Work, including:

1. General characteristics of products
2. Product options
3. System completeness
4. Transportation and handling requirements 5. Storage and protection of products
6. Installation of products.

1.3 RELATED REQUIREMENTS

A. Section 01 25 00 - Substitution Procedures: Requirements for product substitutions.

B. Section 01 33 00 - Submittal Procedures: Requirements applicable to submittals for "or equal" and substitute products.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

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

1. Schedule delivery to minimize long-term storage at site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to site in undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products upon delivery to ensure compliance with Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products at site in manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store products subject to damage by elements above ground, under cover in weather-tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

1.5 PRODUCT SELECTION

A. General: Comply with requirements of the Contract General Conditions.

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

1. General: Comply with requirements of the Contract General Conditions.
2. Products Specified by Reference Standards or Description Only: Any product meeting those standards or description.
3. Products Specified by Indicating Basis for Design: Design and approval is based on systems, products, and assemblies of manufacturer indicated. Equivalent systems, products, and assemblies of other named manufacturers may be used, however, Contractor is responsible for additional approvals required, for coordination with remainder of Contract Documents, and for costs of redesign or recalculation required. Comply with Section 01 25 00 to obtain approval for use of unnamed product.
4. Products Specified by Naming One or More Manufacturers: Products of named manufacturers meeting Specifications. Submit request for substitution for manufacturer not specifically named.
    a. Products of acceptable manufacturers are subject to requirements of Specifications for specified product.
5. Products Specified by Naming One or More Manufacturers with No Known Equals: Products of named manufacturers meeting Specifications: no options, no substitutions.
    a. Products of acceptable manufacturers are subject to requirements of Specifications for specified product.
6. Descriptive Specification Requirements: Where Specifications describe product or assembly, listing exact characteristics required, with or without use of brand or trade name, provide product or assembly that provides characteristics and otherwise complies with Contract requirements.
7. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by manufacturer for application indicated.
    a. Manufacturer's recommendations may be contained in published product literature or by manufacturer's certification of performance.
8. Compliance with Standards, Codes, and regulations: Where Specifications only require compliance with imposed code, standard, or regulation, select product that complies with standards, codes, or regulations specified.
9. Visual Matching: Where Specifications require matching established Sample, Architect's decision will be final on whether proposed product matches satisfactorily.
    a. Where no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of Section 01 25 00 for selection of matching product in another product category.
10. Visual Selection: Where specified product requirements include phrase "... as selected from manufacturer's standard colors, patterns, textures..." or similar phrase, select product and manufacturer that complies with other specified requirements. Architect will select color, pattern, and texture from product line selected.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Installation of Products:

1. Contractor shall comply with manufacturer's instructions and recommendations for installation of products, except where more stringent requirements are specified and necessary due to Project conditions or are required by authorities having jurisdiction.
2. Contractor shall anchor each product securely in place, accurately located and aligned with other Work.
3. Contractor shall clean exposed surfaces and provide protection to ensure freedom from damage and deterioration at time of Contract Completion review. Contractor shall refer to additional requirements specified in Section 01 74 00 - Cleaning Requirements.

END OF SECTION

SECTION 01 71 00

EXAMINATION AND PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Requirements for preparation prior to installing, applying and placing products to determine acceptable conditions for the Work.

B. Layout of the Work and other engineering services necessary to accomplish the Work.

1.3 RELATED REQUIREMENTS

A. Section 01 78 10 - Survey and Layout Data: Requirements for survey and layout data submittals.

B. Individual Division 2 through 33 Product Specification Sections: Specific requirements for preparation prior to performance of the Work.

1.4 LAYOUT OF WORK

A. Surveyor: Contractor shall select and pay for services of a land surveyor, registered in the State of California, for proper performance of the Work.

1. Services of surveyor shall be suitable for layout and verification of location of utilities and site elements.
2. For the Project record, Contractor shall submit the name, address and telephone number of land surveyor before starting survey Work.

PART 2 - PRODUCTS

Not Applicable to this Section.

PART 3 - EXECUTION

3.1 PREPARATION

A. Manufacturer's Requirements: Contractor shall determine product manufacturer's requirements and recommendations prior to commencing Work.

B. Preparations: Contractor shall perform preparation actions according to manufacturer's instructions and recommendations and according to specified procedures.

1. Contractor shall perform surface preparation as necessary to create suitable substrates for application, installation and placement of products.
2. Contractor shall notify Owner's Representative in writing of unsuitable conditions preventing proper performance of the Work.

C. Existing Utility Information: Contractor shall furnish information to serving utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Contractor shall coordinate with Owner's Representative and with authorities having jurisdiction.

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

1. Contractor shall notify Owner's Representative not less than two working days in advance of proposed utility interruptions.
2. Contractor shall not proceed with utility interruptions without written permission from Owner's Representative.

E. Field Measurements: Contractor shall take field measurements as required to fit the Work properly. Contractor shall recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, Contractor shall verify dimensions of other construction by field measurements before fabrication. Contractor shall coordinate fabrication schedule with construction progress to avoid delaying the Work.

F. Space Requirements: Contractor shall verify space requirements and dimensions of items shown diagrammatically on Drawings.

G. Review of Contract Documents and Field Conditions: Immediately upon discovery of the need for clarification of the Contract Documents, Contractor shall submit a Request for Interpretation (RFI) to Architect. Contractor shall include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Contractor shall submit requests in accordance with requirements specified in Section 01 26 13 - Requests for Interpretation (RFI), using form as directed by Owner's Representative.

H. Verification of Construction Layout: Before proceeding to layout the Work, Contractor shall verify layout information shown on Drawings, in relation to the property survey and existing benchmarks, and locate survey reference points. If discrepancies are discovered, Contractor shall promptly notify Owner's Representative, Architect and Project Inspector.

3.2 FIELD ENGINEERING

A. Examination: Contractor shall verify locations of survey control and reference points prior to starting Work. If discrepancies are discovered, Contractor shall promptly notify Owner's Representative, Architect and Project Inspector.

B. Survey Control and Reference Points: Refer to Article 1.5 in Section 01 78 10 - Survey and Layout Data.

3.3 SURVEYING AND FIELD ENGINEERING SERVICES

A. Surveying and Field Engineering Services: Contractor shall provide surveying and field engineering services as necessary for performance of the Work. Refer to Section 01 78 10 - Survey and Layout Data.

1. Contractor shall be responsible for the accuracy and adequacy of surveying and field engineering services.
2. Contractor shall utilize recognized engineering practices.
3. Contractor shall check the location, level and plumb, of every major element as the Work progresses.
4. Contractor shall preserve construction survey stakes and marks for the duration of their usefulness.
5. If construction survey stakes are lost or disturbed, and require replacement, Contractor shall perform replacement at no change in Contract Sum and Contract Time.
6. Contractor shall excavate all holes necessary for line and grade stakes.

B. Surveying for Layout and Control of the Work: Contractor shall establish elevations, lines and levels for all Work under the Contract. Contractor shall locate and lay out by instrumentation and similar appropriate means:

1. Site improvements, including pavements, curbs, headers, sewers, storm drains, structures, and paving. Note on Project Record Drawings utility locations, slopes and invert elevations.
2. Stakes for cutting, filling, grading and topsoil placement, to establish finished grade or flow line indicated on Contract Drawings.
    a. Contractor shall preserve construction survey stakes and marks for the duration of their usefulness.
    b. If construction survey stakes are lost or disturbed, and require replacement, Contractor shall perform replacement at no change in Contract Sum and Contract Time.
    c. Contractor shall excavate all holes necessary for line and grade stakes.
3. Grid or axis for structures, building foundation, column locations and ground floor elevations.
4. Contractor shall establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
5. Contractor shall establish dimensions within tolerances indicated. Contractor shall not scale Drawings to obtain required dimensions.
6. Contractor shall inform installers of lines and levels to which they must comply.
7. When deviations from required lines and levels exceed allowable tolerances, Contractor shall notify Owner’s Representative, Architect and Project Inspector.
8. Contractor shall close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Monuments: Contractor shall establish a minimum of two permanent monuments on site, referenced to established control points. Contractor shall record locations, with horizontal and vertical data, on Project Record Drawings.

1. In accordance with Business and Professions Code section 8772, any monument set by a licensed land surveyor or registered civil engineer to mark or reference a point on a property or land line shall be permanently and visibly marked or tagged with the certificate number of the surveyor or

   civil engineer setting it, each number preceded by the letters "L.S." or "R.C.E." respectively, as the case may be, or, if the monument is set by a public agency, it shall be marked with the name of the agency and the political subdivision it serves.
2. Nothing in this Section shall prevent the inclusion of other information on the tag, which will assist in the tracing, or location of survey records, which relate to the tagged monument.
3. Contractor shall ensure that centerline ties filed with the County Surveyor will be checked for compliance with this law.

D. Site Grading Verification: Upon completion of grading, Contractor shall survey graded areas and establish that elevations are correct and within acceptable tolerances for paving and finish grading.

E. Verification of Work: Contractor shall periodically verify layout and completed conditions of the Work by same means.

END OF SECTION

SECTION 01 73 00

EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. General requirements for installing, applying and placing products.

B. General requirements for correction of defective Work.

1.3 RELATED REQUIREMENTS

A. Individual Division 2 through 33 Product Specification Sections: Specific requirements for installing, applying and placing products.

1.4 EXECUTION

A. Manufacturer's Requirements: Contractor shall determine product manufacturer's requirements and recommendations prior to commencing Work.

B. Execution: Contractor shall perform installation, application and placement actions according to manufacturer's instructions and recommendations and according to specified procedures.

1. Contractor shall perform surface preparation as necessary to create suitable substrates for application, installation and placement of products.
2. Contractor shall notify Owner’s Representative in writing of unsuitable conditions preventing proper performance of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 INSTALLATION, APPLICATION AND PLACEMENT OF PRODUCTS

A. Manufacturer's Instructions: Contractor shall comply with manufacturer's written instructions and recommendations for installing, applying, placing and finishing products.

B. Installation, Application and Placement, General: Contractor shall locate the Work and components of the Work accurately, in correct alignment, orientation and elevation, as indicated.

1. Contractor shall make vertical work plumb and make horizontal work level.
2. Where space is limited, Contractor shall install components to maximize space available for maintenance and ease of removal for replacement.
3. Contractor shall install products at the time and under conditions that will ensure the best possible results. Contractor shall maintain conditions required for product performance until acceptance of the Work.
4. Contractor shall conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

C. Tools and Equipment: Contractor shall not use tools or equipment that produce harmful noise levels.

D. Anchors and Fasteners: Contractor shall provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, Contractor shall mount components at heights directed by Architect.
2. Contractor shall allow for building movement, including thermal expansion and contraction.

E. Joints: Contractor shall make joints of uniform width. Where joint locations in exposed work are not indicated, Contractor shall arrange joints for the best visual effect. Contractor shall fit exposed connections together to form hairline joints.

F. Hazardous Materials: Contractor shall use products, cleaners, and installation materials that are not considered hazardous.

G. Cleaning: Contractor shall comply with requirements specified in Section 01 74 00 - Cleaning Requirements. See individual product Specifications Sections for specific cleaning procedures to be performed.

H. Protection: Contractor shall provide barriers, covers and other protective devices as recommended by manufacturer and complying with general requirements specified in Section 01 71 00 – Examination and Preparation Requirements.

1. Contractor shall comply with manufacturer's written instructions for temperature and relative humidity.
2. See individual product Specifications Sections for specific protective measures to be provided.

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

3.2 OWNER-INSTALLED PRODUCTS A. Not used.

3.3 CORRECTION OF THE WORK

A. Correction of the Work, General: Contractor shall repair or remove and replace defective construction. Contractor shall restore damaged substrates and finishes to match original and new surrounding construction.

1. Contractor shall comply with requirements in Section 01 73 29 - Cutting and Patching Requirements.
2. Repairing shall include replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
3. Contractor shall remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
4. Contractor shall repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
5. Contractor shall remove and replace chipped, scratched, and broken glass.

B. Restoration of Existing Conditions: Contractor shall restore permanent facilities used during construction to their original condition or to match new construction.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

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

B. Work included in this Section:

1. Cutting and patching not required to be performed as part of the Work specified in other Sections.
2. Cutting and patching existing construction altered or disturbed to accommodate new construction.
3. Cutting and patching existing construction damaged or defaced during new construction as required to restore to existing or better condition at the time of award of Contract.
4. Cutting and patching required to:
   a. Install or correct non-coordinated Work.
   b. Remove and replace defective and non-conforming Work.
   c. Remove samples of installed Work for testing.
5. All concrete sidewalk, driveways, approaches shall be removed and replaced scoreline-to-scoreline. Partial removal and saw cutting is no allowed. Contractor shall match existing concrete thickness when replacing any removed section.

C. Refer to other Sections and drawings for specific requirements of the extent and limitations applicable to cutting and patching, demolishing, or altering existing construction of individual parts of the Work.

1. Requirements of this Section also apply to mechanical and electrical installations. (Refer to Division 22, Division 23 and Division 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations).

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed.
2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. List products to be used and firms or entities that will perform work.

4. Indicate dates when cutting and patching is to be performed.

5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
6. Where cutting and patching involves addition of reinforcement to structural elements, submit details to show how reinforcement is integrated with the original structure.
7. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.
8. Effects on Owner operations and on concurrent operations construction by other contractors.

1.4 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

1. Obtain approval from the Architect of the cutting and patching proposal before cutting and patching the following structural elements:
   - Bearing and retaining walls
   - Structural concrete
   - Structural steel
   - Lintels
   - Timber and primary wood framing
   - Structural decking
   - Stair systems
   - Miscellaneous structural metals
   - Equipment supports
   - Piping, ductwork, vessels and equipment

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

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety-related systems:
   - Primary operational systems and equipment
   - Air or smoke barriers
   - Water, moisture, or vapor barriers
   - Membranes and flashings
   - Fire protection systems
   - Noise and vibration control elements and systems
   - Control systems
   - Communication systems
   - Electrical wiring systems

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

D. If possible retain the original installer or fabricator throughout construction phases to cut and patch the following categories of exposed work, or if it is not possible to engage the original installer or fabricator, Contractor shall engage another recognized experienced and specialized firm:

Concrete finishes
Masonry

Stucco and ornamental plaster
Acoustical ceilings
Painting
Wall covering
HVAC enclosures, cabinets or covers

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to existing materials unless not available. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. BEFORE PROCEEDING CONTRACTOR SHALL OBTAIN APPROVAL OF THE ARCHITECT.

B. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered. Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.

1. Before proceeding, meet at the site with parties involved in cutting and patching, including asbestos abatement, mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
2. Beginning of cutting or patching shall be interpreted to mean that existing conditions were found by Contractor to be acceptable.
3. After uncovering existing Work, Contractor shall inspect conditions affecting proper accomplishment of Work.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut where required.

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

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

D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General

1. Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
2. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting

1. Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.
2. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
3. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
4. Cut through concrete and masonry using a cutting machine such as carborundum saw or diamond core drill.
5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
6. Provide fire-safe seals to maintain fire rating at all penetrations.

C. Patching

1. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
2. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
3. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
4. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials if necessary to achieve uniform color and appearance.
5. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken wall section containing the patch, after the patched area has received primer and second coat.
6. Patch, repair or re-hang existing ceilings as necessary to provide an even plane surface of uniform appearance.
7. **Replace concrete walkways to nearest construction joint. Any required repair to a portion of a walkway panel shall require full replacement of said panel from joint to joint in both the northsouth and east-west direction.**

D. Plaster Installation: Comply with manufacturer's instructions and install thickness and coats as indicated.

3.4 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 01 74 00

CLEANING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Cleaning during construction.

B. Cleaning for Contract Completion review and final acceptance of the Work.

1.3 RELATED REQUIREMENTS

A. Additional Requirements: Cleaning for specific products or elements of Work are described in individual product Specification Sections in Divisions 2 through 33. Contractor shall comply also with Owner’s Contractor Safety Handbook.

1.4 SUBMITTALS

A. Product List: Contractor shall submit complete list of all cleaning agents and materials for Owner’s Representative's review and approval.

B. Cleaning Procedures: Contractor shall submit description of cleaning processes, agents and materials to be used for final cleaning of the Work. Processes and degree of cleanliness shall be as directed by Owner’s Representative. All cleaning processes, agents and materials shall be subject to Owner’s Representative's review and approval.

1.5 QUALITY ASSURANCE

A. Cleaning and Disposal Requirements, General: Contractor shall conduct cleaning and disposal operations in compliance with all applicable codes, ordinances and regulations, including environmental protection laws, rules and practices.

B. Cleaning Workers: Contractor shall employ experienced workers or professional cleaners for final cleaning. Contractor shall clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Contractor shall comply with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents and Materials: Contractor shall use only those cleaning agents and materials which will not create hazards to health or property and which will not damage or degrade surfaces. Contractor shall:

1. Use only those cleaning agents, materials and methods recommended by manufacturer of the material to be cleaned.
2. Use cleaning materials only on surfaces recommended by cleaning agent manufacturer.

PART 3 - EXECUTION

3.1 CLEANING DURING CONSTRUCTION

A. Garbage Control: Contractor shall control accumulation of debris, waste materials and rubbish. Periodically, Contractor shall dispose of debris, waste and rubbish off-site in a legal manner.

B. Cleaning, General: Contractor shall clean sidewalks, driveways and streets frequently to maintain public thoroughfares free of dust, debris and other contaminants.

C. Cleaning of Existing Facilities: Contractor shall clean surfaces in existing structures where alteration and renovation Work is being performed or where other construction activities have caused soiling and accumulation of dust and debris. Contractor shall:

1. Clean dust and soiling from floor surfaces.
2. Clean dust from horizontal and vertical surfaces.

D. Parking Area Cleaning: Contractor shall keep parking areas clear of construction debris, especially debris hazardous to vehicle tires.

E. Thoroughfare Clearing and Cleaning: Contractor shall keep site accessways, parking areas and building access and exit facilities clear of mud, soiling and debris. Contractor shall:

1. Remove mud, soil and debris and dispose in a manner which will not be injurious to persons, property, plant materials and site.
2. Comply with runoff control requirements stated above and as required by governing authorities having jurisdiction.

F. Cleaning Frequency: At a minimum, Contractor shall clean Work areas daily.

G. Failure to Clean: Should cleaning by Contractor not be sufficient or acceptable to Owner’s Representative, especially regarding paths of travel, Owner may engage cleaning service to perform cleaning and deduct costs for such cleaning from sums owed to Contractor.

3.2 CONTRACT COMPLETION REVIEW CLEANING, GENERAL

A. Contract Completion Review Cleaning, General: Contractor shall execute a thorough cleaning prior to Contract Completion review by Owner’s Representative and Architect. Contractor shall complete final cleaning before submitting final Application for Payment. Contractor shall:

1. Conduct cleaning in compliance with regulations of authorities having jurisdiction and industrial safety standards for cleaning.
2. Employ professional building cleaners to thoroughly clean building.
3. Complete cleaning operations specified below before requesting inspection for Certification of Completion. Contractor shall:
    a. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Leave concrete floors broom clean.
    b. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
    c. Clean the site, including landscape development areas, of rubbish, litter and foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits.

B. Waste Disposal, Contractor shall:

1. Remove waste materials from the site and conduct disposal in a lawful manner.
2. Do not burn waste materials.
3. Do not bury debris or excess materials on the Owner property.
4. Do not discharge volatile, harmful or hazardous materials into drainage systems.
5. Where extra materials of value remaining after completion of associated work have become the Owner's property, arrange for disposition of these materials as directed.

3.3 INTERIOR CLEANING

A. Interior Cleaning, Contractor shall:

1. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program.
2. Remove labels that are not permanent labels.
3. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from all visible interior and exterior surfaces.
4. Remove dust from all horizontal surfaces not exposed to view, including light fixtures, ledges and plumbing fixtures.
5. Clean all horizontal surfaces to dust-free condition, including tops of door and window frames, tops of doors and interiors of cabinets and casework.
6. Remove waste and surplus materials, rubbish and temporary construction facilities, utilities and controls.

B. Floor Cleaning: At unoccupied spaces, Contractor shall leave concrete floors broom clean.

3.4 EXTERIOR CLEANING

A. Building Exterior Cleaning: Contractor shall clean exterior of adjacent facilities where construction activities have caused soiling and accumulation of dust and debris. Contractor shall:

1. Remove labels that are not permanent labels.
2. Wash down exterior surfaces to remove dust.
3. Clean exterior surfaces of mud and other soiling.
4. Clean exterior side of windows, storefronts and curtainwalls, including window framing.

B. Glass and Mirror Cleaning: Contractor shall clean all glass. Contractor shall replace chipped or broken glass and other damaged transparent materials.

C. Site Cleaning: Contractor shall broom clean exterior paved surfaces. Contractor shall rake clean other surfaces of the grounds. Contractor shall:

1. Wash down and scrub where necessary all paving soiled as a result of construction activities. Thoroughly remove mortar droppings, paint splatters, stains and adhered soil.
2. Remove from the site all construction waste, unused materials, excess soil and other debris resulting from the Work. Legally dispose of waste.

3.5 CLEANING INSPECTION

A. Cleaning Inspection: Prior to Final Payment or acceptance by Owner for partial occupancy or beneficial use of the premises, Contractor and Owner's Representative shall jointly conduct an inspection of interior and exterior surfaces to verify that entire Work is acceptably clean.

B. Inadequate Cleaning: Should final cleaning be inadequate, as determined by Owner's Representative, and Contractor fails to correct conditions, Owner may engage cleaning service under separate contract and deduct cost from Contract Sum.

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

Section includes requirements and procedures for ensuring optimal diversion of construction and demolition (C&D) waste materials generated by the Work from landfill disposal within the limits of the Construction Schedule and Contract Sum.

A. California State law (Public Resources Code sections 40000 *et seq.*) requires the Owner to develop source reduction, re-use, recycling, and composting programs to divert 75% of all solid waste from landfill disposal by 2020. Construction waste materials generated by the Work are targeted to achieve and maintain these diversion rates.

B. The Work of this Contract requires that a minimum of 65% by weight of the construction and demolition materials generated in the Work is diverted from landfill disposal through a combination of re-use and recycling activities (2016 California Green Building Standards Code, Section 5.408).

C. For LEED® projects, requirements for submittal of LEED documentation in compliance with the Materials and Resources category, Construction and Demolition Waste Management credit.

D. Requirements for submittal of Contractor's Construction Waste and Recycling Plan prior to the commencement of the Work.

E. Contractor's quantitative reports for construction waste materials as a condition of approval of the third progress payment.

1.3 DEFINITIONS

A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial, and industrial waste, resulting from construction, remodeling, repair, and demolition operations. A Class III landfill must have a solid waste facilities permit from CalRecycle and is regulated by the Enforcement Agency (EA).

B. Construction and Demolition Debris: Building materials and solid waste resulting from construction, remodeling, repair, cleanup, or demolition operations that are not hazardous as defined in California Code of Regulations, Title 22, and Section 66261.3 *et seq*. This term includes, but is not limited to, asphalt concrete, Portland cement concrete, brick, lumber, gypsum wallboard, cardboard and other associated packaging, roofing material, ceramic tile, carpeting, plastic pipe, and steel. The debris may be commingled with rock, soil, tree stumps, and other vegetative matter resulting from land clearing and landscaping for construction or land development projects.

C. C&D Recycling Center. A facility that receives only C&D material that has been separated for reuse prior to receipt, in which the residual (disposed) amount of waste in the material is less than 10% of the amount separated for reuse by weight.

D. Disposal. Final deposition of construction and demolition or inert debris into land, including stockpiling onto land of construction and demolition debris that has not been sorted for further processing or resale, if such stockpiling is for a period of time greater than 30 days; and construction and demolition debris that has been sorted for further processing or resale, if such stockpiling is for a period of time greater than one year, or stockpiling onto land of inert debris that is for a period of time greater than one year.

E. Enforcement Agency. Enforcement agency as defined [i.e. in Public Resources Code 40130].

F. Inert Disposal Facility or Inert Waste Landfill: A disposal facility that accepts only inert waste such as soil and rock, fully cured asphalt paving, uncontaminated concrete (including fiberglass or steel reinforcing rods embedded in the concrete), brick, glass, and ceramics, for land disposal.

G. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.

H. Mixed Debris Recycling Facility: A processing facility that accepts loads of commingled construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing the nonrecyclable residual materials.

I. Recycling: The process of sorting, cleansing, treating and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.

J. Reuse. The use, in the same or similar form as it was produced, of a material which might otherwise be discarded.

K. Separated for Reuse. Materials, including commingled recyclables, that have been separated or kept separate from the solid waste stream for the purpose of additional sorting or processing those materials for reuse or recycling in order to return them to the economic mainstream in the form of raw material for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace, and includes materials that have been “source separated.”

L. Solid Waste: All putrescible and non-putrescible solid, semisolid, and liquid wastes, including garbage, trash, refuse, paper, rubbish, ashes, industrial wastes, demolition and construction wastes, abandoned vehicles and parts thereof, discarded home and industrial appliances, dewatered, treated, or chemically fixed sewage sludge which is not hazardous waste, manure, vegetable or animal solid and semisolid wastes, and other discarded solid and semisolid wastes. "Solid waste" does not include hazardous waste, radioactive waste, or medical waste as defined or regulated by State law.

M. Source-Separated: Materials, including commingled recyclables, that have been separated or kept separate from the solid waste stream at the point of generation for the purpose of additional sorting or processing of those materials for reuse or recycling in order to return them to the economic mainstream in the form of raw materials for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace.

N. Waste Hauler: A company that possesses a valid permit from the local waste management authority to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal in the locality.

1.4 SUBMITTALS

A. Contractor's Construction Waste and Recycling Plan

A. Review Contract Documents and estimate the types and quantities of materials under the Work that are anticipated to be feasible for on-site processing, source separation for re-use or recycling.

Indicate the procedures that will be implemented in this program to effect jobsite source separation, such as, identifying a convenient location where dumpsters would be located, putting signage to identify materials to be placed in dumpsters, etc.

B. Prior to commencing the Work, submit Contractor's Construction Waste and Recycling Plan. Submit in format provided (**Section 01 74 19A**). The Plan must include, but is not limited to the following:
   a. Contractor's name and project identification information;
   b. Procedures to be used;
   c. Materials to be re-used and recycled;
   d. Estimated quantities of materials;
   e. Names and locations of re-use and recycling facilities/sites;
   f. Tonnage calculations that demonstrate that Contractor will re-use and recycle a minimum 65% by weight of the construction waste materials generated in the Work.

C. Contractor's Construction Waste and Recycling Plan must be approved by the Construction Administrator prior to the start of Work.

D. Contractor's Construction Waste and Recycling Plan will not otherwise relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures.

B. Contractor's Reuse, Recycling, and Disposal Report

A. Submit Contractor's Reuse, Recycling, and Disposal Report on the form provided (**Section 01 74 19B**) with each application for progress payment. Failure to submit the form and its supporting documentation will render the application for progress payment incomplete and delay progress payments. If applicable, include manifests, weight tickets, receipts, and invoices specifically identifying the Project for re-used and recycled materials:
   a. Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick).
   b. Salvaging building materials or salvage items at an off-site salvage or reuse center (i.e. lighting, fixtures).
   c. Recycling source separated materials on site (i.e. crushing asphalt/ concrete for base course, or grinding for mulch).
   d. Recycling source separated material at an offsite recycling center (i.e. scrap metal or green materials).
   e. Use of material as Alternative Daily Cover (ADC) at landfills.
   f. Delivery of soils or mixed inert material to an inert landfill for disposal (inert fill).
   g. Disposal at a landfill or transfer station (where no recycling takes place).
   h. Other (describe).

B. Contractor's Reuse, Recycling, and Disposal Report must quantify all materials generated in the Work, disposed in [Class III] landfills, or diverted from disposal through recycling. Indicate zero (0) if there is no quantity to report for a type of material. C. As indicated on the form:
   a. Report disposal or recycling either in tons or in cubic yards: if scales are available at disposal or recycling facility, report in tons; otherwise, report in cubic yards. Report in units for salvage items when no tonnage or cubic yard measurement is feasible.
   b. Indicate locations to which materials are delivered for reuse, salvage, recycling, accepted as daily cover, inert backfill, or disposal in landfills or transfer stations.

c. Provide legible copies of weigh tickets, receipts, or invoices that specifically identify the project generating the material. Said documents must be from recyclers and/or disposal site operators that can legally accept the materials for the purpose of re-use, recycling, or disposal.

D. Indicate project title, project number, progress payment number, name of the company completing the Contractor's Report and compiling backup documentation, the printed name, signature, and daytime phone number of the person completing the form, the beginning and ending dates of the period covered on the Contractor's Report, and the date that the Contractor's Report is completed.

C. For LEED Projects, complete the LEED Construction and Demolition Waste Management Calculator in format provided under the most current version of the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program. Include a signed cover letter with calculation summary on company letterhead.

A. Certify that the project has completed a waste management plan and diverted construction, demolition, and land clearing waste to uses other than landfill.

B. Provide quantities of diverted materials and means of diversion in accordance with the results table in the LEED Construction and Demolition Waste Management Calculator. C. Indicate how and where waste was diverted.

D. Indicate quantities of waste diverted in tons [or cubic yards].

E. Letter will also include: Total quantity of diverted waste, total quantity of waste, and the percentage of waste diverted.

F. Include name, organization, and role in project. Provide signature and date completed.

G. Include legible copies of weigh tickets, receipts, or invoices that specifically identify the project generating the material. Said documents must be from recyclers and/or disposal site operators that can legally accept the materials for the purpose of re-use, recycling, or disposal.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION

3.1 SALVAGE, RE-USE, RECYCLING AND PROCEDURES

A. Identify re-use, salvage, and recycling facilities.

B. Develop and implement procedures to re-use, salvage, and recycle new construction and excavation materials, based on the Contract Documents, the Contractor's Construction Waste and Recycling Plan, estimated quantities of available materials, and availability of recycling facilities. Procedures may include on-site recycling, source separated recycling, and/or mixed debris recycling efforts.

A. Identify materials that are feasible for salvage, determine requirements for site storage, and transportation of materials to a salvage facility.

B. Source separate new construction, excavation and demolition materials including, but not limited to the following types:

a. Asphalt.
b. Concrete, concrete block, slump stone (decorative concrete block), and rocks.
c. Drywall.
d. Green materials (i.e. tree trimmings and land clearing debris).
e. Metal (ferrous and non-ferrous).
f. Miscellaneous construction debris.
g. Paper or cardboard.
h. Red clay brick.
i. Reuse or salvage materials

j. Soils.
k. Wire and cable.
l. Wood.
m. Other (describe)

C. Miscellaneous Construction Debris: Develop and implement a program to transport loads of mixed (commingled) new construction materials that cannot be feasibly source separated to a mixed materials recycling facility.

3.2 DISPOSAL OPERATIONS AND WASTE HAULING

A. Legally transport and dispose of materials that cannot be delivered to a source separated or mixed recycling facility to a transfer station or disposal facility that can legally accept the materials for the purpose of disposal.

B. Use a permitted waste hauler or Contractor's trucking services and personnel. To confirm valid permitted status of waste haulers, contact the local solid waste authority.

C. Become familiar with the conditions for acceptance of new construction, excavation and demolition materials at recycling facilities, and prior to delivering materials.

D. Deliver to facilities that can legally accept new construction, excavation and demolition materials for purpose of re-use, recycling, composting, or disposal.

E. Do not burn, bury or otherwise dispose of solid waste on the project job-site.

3.3 RE-USE AND DONATION OPTIONS

Implement a re-use program to the greatest extent feasible. Options may include:

California Materials Exchange (CAL-MAX) is a free program sponsored by CalRecycle and is designed to help connect businesses, organizations, manufacturers, schools, and individuals with the most effective online resources for exchanging materials. Go to http://www.calrecycle.ca.gov/CalMAX/. Public Surplus is a government agency surplus auction system used by many public entities. Go to https://www.publicsurplus.com for more information.

3.4 REVENUE

Revenues or other savings obtained from recycled, re-used, or salvaged materials shall accrue to Contractor unless otherwise noted in the Contract Documents.

END OF SECTION

SECTION 01 75 00

STARTING AND ADJUSTING PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Starting systems.

B. Demonstration and instructions.

C. Testing, adjusting, and balancing.

1.3 RELATED REQUIREMENTS

A. Section 01 45 00 - Quality Control

B. Section 01 78 23 - Operation and Maintenance Data

C. Section 01 91 13 – Commissioning Requirements

1.4 STARTING SYSTEMS

A. Contractor shall coordinate schedule for start-up of various equipment and systems.

B. Contractor shall notify Owner’s Representative, Architect, Commissioning Provider and Project Inspector in writing at least seven calendar days prior to start-up of each item.

C. Contractor shall verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions, which may cause damage.

D. Contractor shall verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Contractor shall verify that wiring and support components for equipment are complete and tested.

F. Contractor shall execute start-up under supervision of applicable manufacturer's representative and/or

G. When specified in individual specification Sections, Contractor shall require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report in accordance with Section 01 33 00 - Submittal Procedures that equipment or system has been properly installed and is functioning correctly.

1.5 DEMONSTRATION AND INSTRUCTIONS

A. Contractor shall demonstrate operation and maintenance of Products to Owner's personnel at least two weeks prior to date of Contract Completion review.

B. Contractor shall demonstrate Project equipment and instruct in a classroom environment located at the Owner. The instruction shall be done by a qualified manufacturers' representative who is knowledgeable about the Project.

C. Contractor shall utilize operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

D. Contractor shall demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled agreed time and at equipment/designated location.

E. Contractor shall prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

F. The amount of time required for instruction on each item of equipment and system is that specified in individual sections. If no time is specified in individual sections, Contractor shall include in his/her bid sum a reasonable sum to perform instruction to the satisfaction of the Owner.

1.6 TESTING, ADJUSTING, AND BALANCING

A. Testing Agency: Contractor shall appoint, employ, and pay for services of an independent firm to perform testing, adjusting and balancing.

B. Reports will be submitted by the independent firm to Owner's Representative, Architect and Project Inspector indicating observations and results of tests and indicating compliance or non-compliance with the requirements of the Contract Documents.

C. Owner reserves the right to hire its own independent testing and balancing company to check the work and the report submitted by the Contractor's testing and balancing firm.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
1. Final inspection procedures.
2. Operating and maintenance manual submittal
3. HVAC balance report
4. Spare parts/materials
5. Keys/keying
6. Submittal of warranties
7. Training
8. As-built drawings
9. As-built schedule
10. State Fire Marshal inspection
11. Elevator inspection
12. Other regulatory inspections
13. Removal of temporary facilities
14. Final cleaning and pest control
15. Landscape maintenance
16. Commissioning/equipment startup

1.3 PUNCH LIST INSPECTION

A. When each building/phase is, in the opinion of the Contractor, complete in all respects, the Contractor shall call for a punch-list inspection.

B. Inspection Procedures: On receipt of a request for inspection, the Owner Representative will schedule the Inspection. The Architect will then perform a preliminary walk-through. If, in the judgment of the Owner Representative and the Architect, the project is not sufficiently complete in all respects, the Owner Representative will so advise the Contractor and discontinue the inspection.

1. The Owner Representative and Architect will repeat inspection when requested and assured that the work has been completed.
2. Results of the completed inspection will form the basis of requirements for final acceptance punchlist.

1.4 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents set as a working drawing set for construction purposes. Protect from deterioration and loss in a secure, fire-resistive location. Provide access to record documents for The Owner' and the Architect's reference during normal working hours throughout the course of the Project.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies from the Work as originally shown or specified. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings. Show all utilities, obstructions, etc. not previously noted in the Contract Documents, but discovered through completion of the work.
3. Note related Change Order, Field Instruction and RFI numbers where applicable.
4. Update Record Drawings at a minimum of once per week throughout the course of the Project.
5. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
6. Upon completion of the work, submit Record Drawings to the Owner Representative for further processing.

C. Record Specifications: Maintain one complete copy of the Project Specifications, including addenda, and one copy of other written construction documents such as Change Orders, Field Instructions, RFI's and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

1. Upon completion of the work, submit record Specifications to the Architect for the Owner's records.

D. Operating and Maintenance Manuals: Submit one (1) set to the Architect for review and approval. Once approved send one hard copy set and one electronic set to the Owner with a transmittal to be signed and accepted by the Construction Administrator.

1.5 CLOSEOUT PROCEDURES: CLOSEOUT MEETING

A. The Owner Representative will call for a Project closeout meeting approximately four to six weeks prior to the anticipated completion date.

1. At this meeting, a completion Action List will be prepared listing all major items to be completed prior to the issuance of the Notice of Completion.
2. The Action List shall assign a responsibility and a projected completion date to each item.
3. The Contractor shall be solely responsible for the timely completion of all required closeout items.

1.6 FINAL CLEANING

A. General Cleaning: General cleaning during the construction period is required by the General Conditions and included in Section 01 52 00, Construction Facilities.

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

1. Complete the following cleaning operations before requesting inspection for Certification of Completion.

a. Remove labels that are not permanent labels. Remove temporary protective coverings from finish hardware, toilet accessories and other items.

b. Clean transparent materials, including mirrors and glass in doors and windows (inside and outside). Remove glazing compound and other substances that are noticeable visionobscuring materials. Replace chipped or broken glass and other damaged transparent materials.

c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition.

d. Leave concrete floors broom clean. Thoroughly clean all finish flooring materials in accordance with manufacturer recommendations to as-new condition. Remove any stains, films, or foreign materials. Thoroughly vacuum all carpets and shampoo if necessary.

e. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean and polish plumbing fixtures to a sanitary condition. Clean light fixtures, lamps and lenses.

f. Clean the site, including landscape development areas, of rubbish, litter and foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits.

C. Pest Control: Engage an experienced licensed exterminator to make a final inspection, and rid the project of rodents, insects and other pests.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the work during construction and repair site to previous conditions.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner. Where extra materials of value remaining after completion of associated work have become the Owner’s property, arrange for disposition of these materials as directed.

1.7 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of Owner and Architect's final acceptance, complete the following:

1. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Architect and the Owner Representative.

B. Re-inspection Procedure: The Owner and Architect will re-inspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Owner.

1. Upon completion of re-inspection, the Architect will prepare and submit to the Owner, a certificate of final acceptance, or advise the Contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. Upon final acceptance by the Owner and the Architect, the Owner Representative will then prepare a letter to the Owner stating that the project has been constructed in accordance with the contract documents and is complete in all respects.

C. Completion Schedule: All punch list corrections shall be completed by Contractor within 30 days after Substantial Completion or the contract completion date, whichever is earlier. The Owner reserve the right to complete any outstanding punch list work remaining after the thirty-day period at Contractor's expense.

D. Additional Inspections: Should additional re-inspections be required, Contractor shall reimburse Owner for Owner Representative's and Architect's account for time spent in conducting additional re-inspections at a rate of 3.2 times rate of Direct Personnel Expense (DPE). Direct Personnel Expense is defined as direct salaries of Owner Representative's and Architect's personnel engaged on Project and portion of costs of mandatory and customary contributions and benefits related

thereto, including employment taxes and other statutory benefits, insurance, sick leave, holidays, vacations, pensions, and similar contributions and benefits.

1.8 FINAL PAYMENT

A. Final Payment: After completion of all items listed for completion and correction and after submission of all documents and products and after final cleaning, Contractor shall submit final Application for Payment, identifying total adjusted Contract Sum, previous payments and sum remaining due. Payment will not be made until the following are accomplished:

1. All Project Record Documents have been received and accepted by the Architect.
2. All extra materials and maintenance stock have been transferred and accepted by Owner.
3. All warranty documents and operation, maintenance data, service agreements, maintenance contracts and salvage materials have been received and accepted by Owner's Representative.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 78 10

SURVEY AND LAYOUT DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Administrative requirements for survey and layout data submittals.

1.3 RELATED REQUIREMENTS

A. Section 01 71 00 – Examination & Preparation Requirements: Layout of the Work and other engineering services required for accomplishing the Work.

B. Section 01 77 00 - Contract Closeout Procedures: Submittals for occupancy, Acceptance and Final Payment.

1.4 LAYOUT OF THE WORK

A. Responsibility for Layout of the Work: Contractor shall be solely responsible for complete, timely and accurate layout of the Work including, but not necessarily limited to, horizontal and vertical control and dimensional coordination as necessary to construct the Work in accordance with the Contract Documents. Contractor shall:

1. Employ a Land Surveyor or a Civil Engineer, registered in the State of California, to perform survey work.
2. Employ a Professional Engineer, of the discipline required for the specific service on the Project, and licensed in the State of California where required in the specifications in Divisions 2 through 33.

1.5 PROJECT SURVEY CONTROL POINTS

A. Survey Reference Points: Existing basic horizontal and vertical control points are shown on the Contract Documents, or location of control points will be furnished by the Owner Representative. Contractor shall use the Owner Survey, provided by the Owner Representative, as the Basis of Bearings for survey horizontal control, and shall tie at least one Project site control point to a point on the Owner Survey. NAVD 29 and NAD 83 shall be used for vertical and horizontal control. Contractor shall:

1. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction.
2. Make no changes or relocations without prior written notice to Architect.

3. Report to Owner Representative and Architect when any reference point is lost or destroyed. Lost or destroyed reference control points
4. Require a surveyor to replace project control points, which may be lost or destroyed. Establish replacements based on original survey control.

B. Contractor shall establish a minimum of two permanent benchmarks on the project site that are referenced to control points identified in the Contract Documents. Document horizontal and vertical location of benchmarks on the project record documents.

1.6 SUBMITTALS

A. Submit, name, address, and telephone number of Surveyor before starting survey work.

B. On request of Architect, submit documentation to verify accuracy of field engineering work.

C. Submit certificate signed by the Land Surveyor, licensed to practice in the State of California, certifying that elevations and locations of improvements are in conformance with the requirements of the Contract Documents.

1.7 SURVEY RECORD DOCUMENTS

A. Survey Record Documents: Contractor shall maintain a complete and accurate log of control and survey work as Work progresses. Upon completion of foundation walls, infrastructure, and major site improvements, Contractor shall prepare a certified survey illustrating dimensions (horizontal NAD 83 and vertical NAVD 29), locations, angles and elevations of new construction and site work. The certified survey shall also document existing infrastructure encountered during construction. Contractor shall submit survey record documents as specified in Section 01 77 00 - Contract Closeout Procedures.

B. Locations provided on the certified survey shall be provided by a licensed land surveyor and coordinated with the control points tied to the Owner Record of Survey as per paragraph 1.4-A above.

C. For each new Project utility or improvement which is not to be owned and maintained by the Owner, Contractor shall provide a legal description and plot, stamped and signed by a properly licensed surveyor or Civil Engineer, and which will use the Owner Record of Survey as the Basis of Bearings and will provide a Point of Commencement shown on said Record of Survey.

1.8 CONTRACTOR'S REVIEW

A. Scope of Contractor's Review: Contractor shall review Survey and layout data prior to submission for Owner’s review or filing. Contractor shall sign each submittal copy certifying that:

1. Field measurements have been determined and verified.
2. Field construction criteria have been verified.
3. Conformance with Drawings and Specifications requirements is confirmed.

B. Contractor's Review Action: Contractor shall indicate clearly on survey and layout data whether the dimensions and coordinates are in compliance with Contract requirements. Contractor shall note clearly and sign each submittal certifying that reported data "Conforms" or "Does Not Conform".

C. Changes and Deviations: Contractor shall identify all deviations from requirements of Drawings and Specifications. Changes in the Work shall not be authorized by submittals review actions. No review

action, implicit or explicit, shall be interpreted to authorized changes in the Work. Changes shall only be authorized by separate written Change Order or Field Instruction, in accordance with the Contract General Conditions.

1.9 REVIEWS BY OWNER'S REPRESENTATIVE AND ARCHITECT

A. Reviews by Owner's Representative and Architect, General: Reviews of survey and layout data by Owner's Representative and Architect, or other responsible design professional, shall be only for general conformance with the design concept and requirements based on the information presented. Neither Architect nor other responsible design professional shall verify submitted survey and layout data.

B. Contract Requirements: Reviews by Owner's Representative, Architect or other responsible design professional shall not relieve the Contractor from compliance with requirements of the Drawings and Specifications. Changes shall only be authorized by separate written Change Order or Field Instruction, in accordance with the Contract General Conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Format and content of operation and maintenance manuals.

1. Data requirements for materials and finishes.
2. Data requirements for equipment and operating systems. B. Instruction of

Owner's personnel.

C. Submission of operation and maintenance manuals.

1.3 RELATED REQUIREMENTS

A. Section 01 31 13 - Coordination: Coordination documents and models prepared for performance of the Work, to be incorporated into operation and maintenance data submitted to Owner's Representative at Contract closeout.

B. Product Specifications Sections in Divisions 2 through 33: Specific requirements for operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:

1. Trained and experienced in maintenance and operation of described products.
2. Familiar with requirements of this Section.
3. Skilled as technical writer to the extent required to communicate essential data.
4. Skilled as draftsman competent to prepare required drawings.

1.5 SUBMITTALS

A. Submittal for Review: Contractor shall submit one electronic bookmarked PDF copy to Engineer for review and approval at least three (3) months before the anticipated Project Completion Date.

B. Final Submittal: Contractor shall submit one electronic PDF copy and three hard copies prior to submission of final Application for Payment.

1.6 SUBMITTAL FORMAT

A. Format for Operation and Maintenance Data Manuals: Contractor shall prepare data in the form of an instructional manual. Contractor shall comply with the general requirements specified below and comply with specific requirements for types of products in Articles following. See Article titled "SUBMISSION OF OPERATION AND MAINTENANCE MANUALS" for number of copies of manuals.

B. Electronic File: Contractor shall also provide all operation and maintenance data into a single PDF bookmarked file with a table of contents. The table of contents shall be linked to the various sections in the PDF file.

C. Hard Copy Format:

1. Size: 8-1/2 in. by 11 in.
2. Paper: Manufacturer's printed data, or neatly typewritten.
3. Drawings:
   a. Provide reinforced punched binder tab, bind in with text.
   b. Fold larger drawings to size of text pages.
4. Provide fly-leaf for each separate product, or each piece of operating equipment.
5. Organize manual in order of specification Divisions and Sections.
   a. Provide typed description of product, and major component parts of equipment.
   b. Provide indexed tabs.
6. Cover: Identify each volume with typed or printed title, "Operating and Maintenance Instructions". List: a. Title of Project
   b. Identity of separate structure as applicable.
   c. Identity of general subject matter covered in the manual.
7. Binders:
   a. Commercial quality three-ring binders with durable and cleanable plastic covers.
   b. Maximum ring size: 2 inches per 170 sheets
   c. When multiple binders are used, correlate the data into related consistent groupings.

1.7 CONTENT OF MANUAL

A. Neatly typewritten table of contents for each volume, arranged in systematic order.

1. Include name of Contractor, name of responsible principal, address and telephone number.
2. Include a list of each product required to be included, indexed to content of the volume.
3. List, with each product, the name, address and telephone number of:
   a. Subcontractor or installer.
   b. Maintenance contractor, as appropriate.
   c. Local source of supply for replacement parts.
4. Identify each product-by-product name and other identifying symbols as set forth in Contract Documents.

B. Product Data:

1. Include only those sheets that are pertinent to the specific product.

2. Annotate each sheet to:
    a. Clearly identify specific product or part installed.
    b. Clearly identify data applicable to installation.
    c. Delete references to inapplicable information.

C. Drawings:

1. Supplement product data with drawings as necessary to clearly illustrate:
    a. Relations of Component parts of equipment and systems.
    b. Control and flow diagrams.
2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
    a. Do not use Project Record Documents as maintenance drawings.

D. Provide written text as required to supplement product data for the particular installation:

1. Organize in a consistent format under separate headings for different procedures.
2. Provide logical sequence of instructions for each procedure.

E. Provide a copy of each warranty, bond and service contract issued.

1. Provide information sheet for Owner's personnel, including:
    a. Proper procedures in event of failure.
    b. Instances that might affect validity of warranties or bonds.

F. Provide a copy of each Material Safety Data Sheet (MSDS) received with products or materials delivered to the site for incorporation into the Project, for Owner's future reference.

1.8 MANUAL FOR MATERIALS AND FINISHES

A. Content, for architectural products, applied materials and finishes:

1. Manufacturer's data, giving full information on products.
    a. Catalog number, size, and composition.
    b. Color and texture designations.
    c. Information required for re-ordering special manufactured products.
2. Instructions for care and maintenance.
    a. Manufacturer's recommendation for types of cleaning agents and methods.
    b. Cautions against cleaning agents and methods that are detrimental to the product.
    c. Recommended schedule for cleaning and maintenance.

B. Content, for moisture-protection and weather-exposed products:

1. Manufacturer's data, giving full information on products.
    a. Applicable standards.
    b. Chemical composition.
    c. Details of installation.
2. Instructions for inspection, maintenance, and repair.

C. Additional requirements for maintenance data: Refer to other sections of Specifications.

1.9 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Content for each unit of equipment and system, shall be as follows (as appropriate):

1. Description of unit and component parts
   a. Function, normal operating characteristics, and limiting conditions
   b. Performance curves, engineering data and tests
   c. Complete nomenclature and commercial number of replaceable parts 2. Operating Procedures:
      a. Start-up, break-in, routine and normal operating instructions
      b. Regulation, control, stopping, shutdown, and emergency instructions
      c. Seasonal operating instructions
      d. Special operating instructions 3. Maintenance Procedures:
      a. Routine operations
      b. Guide to "trouble shooting"
      c. Disassembly, repair and re-assembly
      d. Alignment, adjusting and checking 4. Servicing and lubrication schedule.
   a. List of lubricants required
   b. Servicing schedule
5. Manufacturer's printed operating and maintenance instructions
6. Description of sequence of operation by control manufacturer
7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for Maintenance
   a. Predicted life of parts subject to wear
   b. Items recommended to be stocked as spare parts
8. As-installed control diagrams by controls manufacturer
9. Each contractor's coordination drawings
   a. As-installed color-coded piping diagrams
10. Charts of valve tag numbers, with location and function of each valve
11. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage
12. Other data as required under pertinent sections of specifications

B. Content, for each electric and electronic system, as appropriate:

1. Description of system and component parts
   a. Function, normal operating characteristics and limiting conditions
   b. Performance curves, engineering data and tests
   c. Complete nomenclature and commercial number of replaceable parts 2. Circuit directories of panel boards.
   a. Electrical service
   b. Controls
   c. Communications
3. As-installed color coded wiring diagrams 4. Operating procedures:
   a. Routine and normal operating instructions
   b. Sequences required
   c. Special operating instructions 5. Maintenance procedures:
   a. Routine operations

b. Guide to "trouble-shooting."
c. Disassembly, repair and reassembly.
d. Adjustment and checking.

6. Manufacturer's printed operating and maintenance instructions.
7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
8. Other data as required under pertinent sections of specifications.

C. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.

D. Additional requirements for operating and maintenance data: As required by other sections of specifications.

1.10 INSTRUCTION OF OWNER PERSONNEL

A. Operating and maintenance manual shall constitute the basis of instruction.

1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

B. Complete additional training as specified in other sections of the Specifications. Refer to Section 01 75 00, Starting and Adjusting Procedures.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 78 36

WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers' standard guaranties, warranties on products and special warranties.

B. Refer to the General conditions for terms of the Contractor's special warranty of workmanship and materials.

C. Specific requirements for warranties for the work and products and installations that are specified to be guaranteed or warranted are included in the individual Sections of Divisions 2 through 33.

D. Certifications and other commitments and agreements for continuing services to the Owner are specified elsewhere in the Contract Documents.

E. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 RELATED REQUIREMENTS

A. Section 01 77 00 - Contract Closeout Procedures: General requirements for closeout of the Contract.

B. Section 01 78 23 - Operation and Maintenance Data: Operating and maintenance data binders, to include copies of warranties and bonds.

C. Product Specification Sections in Divisions 2 through 33: Special Project warranty requirements for specific products or elements of the Work; commitments and agreements for continuing services to Owner.

1.4 DEFINITIONS

A. The terms product guaranty or warranty are synonymous for this Project and shall be taken to mean the required guaranty or warranty required by the Contract General Conditions or by the Contract Drawings or Specifications.

B. Standard Product Warranties are pre-printed written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

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

1.5 WARRANTY REQUIREMENTS

A. Warranty Period: The warranty period begins on the day that the Notice of Completion is recorded with San Mateo County. The Warranty Period is two (2) years from this date.

B. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

C. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

D. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the work through a portion of its anticipated useful service life.

E. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

E. The Owner reserves the right to refuse to accept work for the Project where a special warranty, certification, or similar commitment is required on such work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.6 SUBMITTALS

A. Submit a copy of the Standard or Special written warranties to the Owner for each Specification Section as part of the complete submittal package for review and approval by the Owner.

B. Submit written warranties to the Owner prior to the date of acceptance by the Owner. Submittal of the project Guarantees and Warranties is a requirement precedent to the filing of the Notice of Completion by the Owner.

1. When a designated portion of the work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period but prior to acceptance of the entire project, Contractor shall submit properly executed warranties to the Owner within fifteen days of occupancy or use of that designated portion of the work.

C. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner for approval prior to final execution.

D. Form of Submittal: At Final Completion, compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual. Use guarantee form at the end of this Section.

E. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-inch by 11-inch paper.
   1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name, of the product, and the name, address and telephone number of the installer.
   2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES & GUARANTEES ", the Project title or name, and the name of the Contractor.
   3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Requirements for Project Record Documents to be submitted for Contract closeout.

1.3 PROJECT RECORD DOCUMENTS

A. General:

1. Contractor shall not use Record Documents for construction purposes.
2. Contractor shall protect from deterioration and loss in a secure, fire-resistive location; provide access to Record Documents for the Owner's and the Architect's reference during normal working hours.
3. Contractor shall keep Project Record Documents current, as they will be reviewed for completeness by Architect, Inspector, and Owner's Representative as condition for certification of each Progress Payment Application.

B. Record Drawings: Contractor shall record information continuously as Work progresses. Contractor shall not conceal Work permanently until all required information is recorded. Contractor shall:

1. Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately.
2. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
3. Legibly and to scale, mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the work.
4. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings. Record actual construction, including:
    a. Distance to two permanent landmarks (significant tree, building corner, etc.) for utility boxes, hand-holes, irrigation boxes, and other site utilities that may be concealed by tall grass or flowers.
    b. The following for underground utilities and valves installed and encountered:
        1) Shoot horizontal centerline, width and vertical top of pipe/utility locations and valves, referenced to permanent ground improvements along with GPS X, Y and Z coordinates.
        2) Service type.
        3) Pipe/utility size.
        4) Pipe/utility material.
    c. Field changes of dimension and detail.
    d. Details not on original Contract Drawings. Application of copies of details produced and provided by Architect during construction will be accepted.

5. Note related Change Order numbers where applicable.
6. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
7. Store Record Documents separate from documents used for construction.

C. Record Specifications: Contractor shall record changes made by Addenda and Change Orders. Contractor shall legibly mark and record in red ink actual Products installed or used, including:

1. Manufacturer's name and product model or catalog number.
2. Product substitutions or alternates utilized.

D. Record Photos: Contractor shall photograph all work before covering up, including:

1. All open trenches and manholes shall be photographed.
2. All exposed utilities should be identified in the photos.
3. Show photographs locations on Record Drawings.

E. Initial Submission:

1. Prior to the date of the Notice of Completion, Contractor shall submit color PDF scanned or digitally reproduced set of drawings marked “Record Documents to Architect” for review, approval and further processing.
2. Prior to the date of the Notice of Completion, Contractor shall submit annotated PDF electronic file marked “Record Specifications to Architect” for review, approval and further processing.
3. Architect will indicate whether general scope of changes, additional information recorded, and quality of mark-ups are acceptable.

F. Final Submission:

1. Submit color PDF scanned record prints and a set of reproducible, digital mark-up as-built drawings marked “Record Documents.”
2. Include each sheet, whether or not changes and additional information were recorded.
3. Submit annotated PDF electronic file marked “Record Specifications.”
4. Submit compressed archive file titled “Record Photographs.”
5. Submit Entire record of project documents catalogued on the Electronic Project Management Platform

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 024116

STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of buildings.

Related Requirements:

2. Section 011000 "Summary" for use of the premises and phasing requirements.
3. Section 013200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
4. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at [Project site] <Insert location>.

1. Inspect and discuss condition of construction to be demolished.
2. Review items to be salvaged and returned to Owner.

1.5 INFORMATIONAL SUBMITTALS

A. Schedule of Building Demolition Activities: Indicate the following:

1. Sequence of demolition work.
2. Temporary interruption of utility services.
3. Shutoff and capping of utility services.

1.6 FIELD CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Hazardous Materials: Present in buildings and structures to be demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

C. On-site storage or sale of removed items or materials is not permitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

2.2 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

B. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

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

3.2 PREPARATION

A. Salvaged Items: Comply with the following:

1. Clean salvaged items of dirt and demolition debris.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to storage area [designated by Owner] [indicated on Drawings].
5. Protect items from damage during transport and storage.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Utilities to Be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.
1. Arrange to shut off utilities with utility companies.
2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
4. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of demolition.

C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.

a. Provide at least [72] <Insert number> hours' notice to occupants of affected buildings if shutdown of service is required during changeover.

D. Temporary Protection:
1. Protect existing site improvements, appurtenances, and landscaping to remain.

3.5 DEMOLITION, GENERAL

A. General: Demolish indicated buildings completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain fire watch during and for at least 1 hour after flame-cutting operations.
3. Maintain adequate ventilation when using cutting torches.
4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Explosives: Use of explosives is not permitted.

3.6 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, [completely] [to at least 6 inches (150 mm) below grade] [to at least 12 inches (300 mm) below grade] [to depths indicated].

D. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, to at least 12 inches below grade.

E. Existing Utilities: Abandon existing utilities and below-grade utility structures. Cut utilities a minimum of 12 inches below grade.

3.7 SITE RESTORATION

A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.8 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.10 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

1. Clean roadways of debris caused by debris transport.

END OF SECTION 024116

SECTION 031000

CONCRETE FORMING AND ACCESSORIES

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Form-facing material for cast-in-place concrete.
2. Shoring, bracing, and anchoring.

B. Related Requirements:

1. Section 033300 "Architectural Concrete" for formwork related to BBQ Counter special concrete.

1.3 DEFINITIONS

A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.

B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Exposed surface form-facing material.
2. Concealed surface form-facing material.
3. Form ties.
4. Form-release agent.

1.5 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:

    a. Plywood, metal, or other approved panel materials.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

C. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

2.3 RELATED MATERIALS

A. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
2. Form release agent for form liners shall be acceptable to form liner manufacturer.

B. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with ACI 301 (ACI 301M).

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M) and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes [and] [Section 033300 "Architectural Concrete"].

C. Limit concrete surface irregularities as follows:
1. Surface Finish-2.0: ACI 117 Class B, 1/4 inch (6 mm).
2.

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
3. Install keyways, reglets, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips
2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
2. Locate temporary openings in forms at inconspicuous locations.

I. Chamfer exterior corners and edges of permanently exposed concrete.

J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches (305 mm).

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

L. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3. Place joints perpendicular to main reinforcement.

M. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

N. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

O. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3.3 REMOVING AND REUSING FORMS

Revise removal time in first paragraph below if required. Period of 24 hours is halved to 12 hours in ACI 347R. Commentary in ACI 318 (ACI 318M) recognizes 12 hours for concrete, using regular portland cement, but advises that this period may be insufficient for concrete using Type II and Type V portland cements or ASTM C595/C595M blended hydraulic cements, concrete with retarding admixtures, and concrete using ice during mixing.

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for [24] hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

B. Clean and repair surfaces of forms to be reused in the Work.

1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
2. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

1. Align and secure joints to avoid offsets.
2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 FIELD QUALITY CONTROL

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

END OF SECTION 031000

SECTION 032000

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

B. Related Requirements:

1. Section 033000 "Cast -In-Place Concrete"
2. Section 033300 "Architectura Concrete"

1.2 PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a conference.

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Steel-reinforcement installation.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Epoxy repair coating.
3. Zinc repair material.
4. Bar supports.
5. Mechanical splice couplers.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical

splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

3. For structural thermal break insulated connection system, indicate general configuration, insulation dimensions, tension bars, compression pads, shear bars, and dimensions.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structures.

1. Location of construction joints is subject to approval of Architect.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."
2. Dual-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."

C. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

2. Mechanical splice couplers.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

Retain "Testing Agency Qualifications" Paragraph below if Contractor retains testing and inspection agency for field quality control. Retain option if field quality-control testing and inspection agency employed by Contractor must be approved by authorities having jurisdiction.

A. Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1.6 DELIVERY, STORAGE, AND HANDLING

Retain option in "Steel Reinforcement" Paragraph below if zinc-coated, epoxy-coated, or dual-coated steel reinforcement is required.

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, **Grade 60,**deformed.

B. Steel Bar Mats: ASTM A184/A184M, fabricated from [**ASTM A615/A615M, Grade 60** deformed bars, assembled with clips.

C. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

2.2 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615/A615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.

2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch (25 mm), not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318 (ACI 318M).

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches (610 mm), whichever is greater.
2. Stagger splices in accordance with ACI 318 (ACI 318M).

3. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

    a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches (305 mm).

4. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches (50 mm) for plain wire and 8 inches (200 mm) for deformed wire.
5. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
6. Lace overlaps with wire.

3.3 JOINTS

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

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117 (ACI 117M).

3.5 FIELD QUALITY CONTROL

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

B. Inspections:

END OF SECTION 032000

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
2. Section 033300 "Architectural Concrete" for above grade specially finished formed concrete.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete Subcontractor.
   e. Special concrete finish Subcontractor.
2. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction joints, control joints, isolation joints, and joint-filler strips.
c. Semirigid joint fillers.
d. Anchor rod and anchorage device installation tolerances.
e. Cold and hot weather concreting procedures.
f. Concrete finishes and finishing.
g. Curing procedures.
h. Forms and form-removal limitations.
i. Shoring and reshoring procedures.
j. Methods for achieving specified floor and slab flatness and levelness.
k. Floor and slab flatness and levelness measurements.
l. Concrete repair procedures.
m. Concrete protection.
n. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
o. Protection of field cured field test cylinders.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Silica fume.
5. Other pozzolan.
6. Aggregates.
7. Admixtures.
8. Color pigments.
9. Curing materials.
   a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.
10. Joint fillers.
11. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Slump limit.
6. Air content.
7. Nominal maximum aggregate size.
8. Intended placement method.
9. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
    a. Location of construction joints is subject to approval of the Architect.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Aggregates.
3. Admixtures.
4. Curing compounds.
5. Bonding agents.
6. Adhesives.
7. Semirigid joint filler.
8. Joint-filler strips.
9. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Silica fume.
5. Other pozzolan
6. Aggregates.
7. Admixtures.

D. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

1. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Field Quality Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests shall be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.
2. Distribute all test reports of acceptance testing to the licensed design professional, contractor, and ready-mix producer per ACI 318 26.12.1.1

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report:
   a. Admixture dosage rates.
   b. Slump.
   c. Air content.
   d. Compressive strength at specified design strength age.
   e. Permeability, when a value is specified for the mix design.
   f. Drying shrinkage, when a value is specified for the mix design.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.10 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Regional Materials: Aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand or from the same manufacturer's plant.

C. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type II.
2. Portland Cement: ASTM C595, Type IL
3. Fly Ash: ASTM C618, Class F.
4. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
5. Silica Fume: ASTM C1240 amorphous silica.
6. Other Pozzolans: ASTM C618, Class N

D. Normal-Weight Aggregates: ASTM C33/C33M, #57 coarse aggregate or better, graded.

1. Alkali-Silica Reaction: Comply with one of the following:
   a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
   b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.

c. Expansion Results of Aggregate: Not more than 0.10 percent after 14 days immersion when tested in accordance with ASTM C1260.
d. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.

2. Maximum Coarse-Aggregate Size: 1 inch nominal.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Air-Entraining Admixture: ASTM C260/C260M.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Specific Performance Admixture: ASTM C494/494M, Type S.

G. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.3 CURING MATERIALS

A. Water: Potable or complying with ASTM C1602/C1602M.

B. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. W.R. Meadows, Inc.
      1) 1100: Resin-Based, Water Emulsion Concrete Curing Compound
      2) Or Approved Equal

2.4 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

B. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

1. Types I and II, non-load bearing Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.5 CONCRETE MIXTURES, GENERAL

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

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 30 percent by mass.
2. Slag Cement: 50 percent by mass.
3. Silica Fume: 10 percent by mass.
4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 70 percent by mass, with fly ash or pozzolans not exceeding 30 percent by mass and silica fume not exceeding 10 percent by mass.
5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 30 percent by mass and silica fume not exceeding 10 percent by mass.

C. Concrete with In-Situ Recycled Carbon Dioxide Mineralization: Minimum cementitious content and maximum water/cementing materials ratio requirement as outlined by this specification will be reviewed and may be adjusted by the Engineer pending review of submittal, if required. Adjustment of cementitious content and water/cementing materials ratio requirement will be at the sole discretion of the Engineer.

D. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
5. Use permeability-reducing admixture in concrete mixtures where indicated.

2.6 CONCRETE MIXTURES

A. Normal-weight concrete used for walls, footings, grade beams, and tie beams.

1. Minimum Compressive Strength: 4000 psi at 56 days
2. Minimum Fly Ash Content: 25%
3. Minimum Slag Content: 45%
4. Include Maximum Amount of In-Situ Carbon Dioxide Mineralization Allowed Per Concrete Mix Design Engineer
5. Maximum Aggregate Size: 1"
6. Air Content: Maintain range permitted by ACI 301

B. Normal-weight concrete used for sidewalks and paving.

1. Minimum Compressive Strength: 3000 psi @ 56 days
2. Minimum Fly Ash Content: 20%
3. Minimum Slag Content: 30%
4. Include Maximum Amount of In-Situ Carbon Dioxide Mineralization Allowed Per Concrete Mix Design Engineer
5. Maximum Aggregate Size: 1"
6. Air Content: Maintain range permitted by ACI 301

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish batch ticket information.

1. Site mixing shall only be permitted with prior approval by the Owner's Representative.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 JOINTS

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

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
2. Place joints perpendicular to main reinforcement.
   a. Continue reinforcement across construction joints unless otherwise indicated.
   b. Do not continue reinforcement through sides of strip placements of floors and slabs.
3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

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

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inchbelow finished concrete surface, where joint sealants are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.5 CONCRETE PLACEMENT

A. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
    a. Do not use vibrators to transport concrete inside forms.
    b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
    c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.6 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
    d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
    e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
        1) Recoat areas subject to heavy rainfall within three hours after initial application.
        2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.

3.7 TOLERANCES

A. Conform to ACI 117.

3.8 CONCRETE SURFACE REPAIRS

A. Prior to repairing or patching any surface defects in the concrete, review areas and repair process and materials with Landscape Architect or Owner's Representative in the field.

1. Provide a repair mock-up using the process and materials approved by Landscape Architect or Owner's Representative for review and approval prior to initiating site-wide repair work.

B. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

C. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
   a. Limit cut depth to 3/4 inch.
   b. Make edges of cuts perpendicular to concrete surface.
   c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
   d. Fill and compact with patching mortar before bonding agent has dried.
   e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
   a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
   b. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

E. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
   a. Correct low and high areas.
   b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
   a. Finish repaired areas to blend into adjacent concrete.

5. Correct other low areas scheduled to remain exposed with repair topping.
   a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
   b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
   a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
   b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
   c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
   d. Place, compact, and finish to blend with adjacent finished concrete.
   e. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
   a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
   b. Dampen cleaned concrete surfaces and apply bonding agent.
   c. Place patching mortar before bonding agent has dried.
   d. Compact patching mortar and finish to match adjacent concrete.
   e. Keep patched area continuously moist for at least 72 hours.

F. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

G. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.9 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
   a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
      1) Project name.
      2) Name of testing agency.
      3) Names and certification numbers of field and laboratory technicians performing inspections and testing.

4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.
7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results.
13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

4. Testing agency shall distribute all test reports of acceptance testing to the licensed design professional, contractor, and ready-mixed producer per ACI 318 26.12.1.1.e.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:

1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M:
   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.
3. Slump Flow: ASTM C1611/C1611M:
   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for structural lightweight concrete.

a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

5. Concrete Temperature: ASTM C1064/C1064M:
   a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
6. Compressive-Strength Tests: ASTM C39/C39M.
   a. A valid strength test according to ACI 318 shall be conducted at 7 days and 28 days.
   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
10. Additional Tests:
    a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
       1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 hours of completion of floor finishing and promptly report test results to Architect.

3.10 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.

END OF SECTION 033000

SECTION 033300

ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes:

This section includes requirements for Cast-in-Place (CIP) Architectural Concrete work for all vertical, above-grade concrete site elements, including formwork, reinforcement and finishing affecting the finished appearance of the Work.

1. Custom Barbeque Counters

B. Related Sections include:

1. Section 312000 “Earthwork”
2. Section 321216 “Asphalt Concrete”
3. Section 123640 “Stone Countertops”
4. Section 055000 “Metal Fabrications and Finishes”

1.3 DEFINITIONS

A. Architectural Site Concrete: Formed concrete that is exposed to view on surfaces of completed structure and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance. Surfaces of architectural concrete elements that are not exposed to view in the completed work, need not conform to requirements of this Section.

1.4 REFERENCES

A. Standards listed below apply to this Section. Where the applicable year of adoption or revision is not listed below, the latest edition applies.

B. ASTM: Standards of the American Society for Testing and Materials (ASTM) apply where designated in this Section. Use applicable year of adoption or revision as published in the 2017 “Annual Book of ASTM Standards”.

C. American Concrete Institute's ACI 303.1 - Specification for Cast-in-Place Architectural Concrete.

D. Design and Control of Concrete Mixtures – Thirteenth Edition; Portland Cement Association.

1.5 QUALITY ASSURANCE

A. Subcontractor Qualifications: Only experienced Architectural Cast-in-place Concrete installers, certified to install Sedimentary walls are acceptable for this project. Acceptance of certification will be based on proof of certification, experience and submission of Subcontractor qualifications as part of the Bid.

1. Installer: Shaw & Sons or approved equivalent.

B. As part of the bid submittal the General Contractor shall submit background information and/or qualifications on his Architectural Cast-in-place Contractor certified for Sedimentary Concrete installation. This information shall provide evidence to indicate successful experience in providing concrete work identical to that specified herein. A listing of projects photographs of shall be reviewed and approved as comparable projects to the specified work by the Owner prior to award of bid. Failure to provide this information or the submittal of incomplete or inaccurate information shall give cause to reject the entire bid as nonresponsive and incomplete. The submittal shall provide the Owner with evidence of successful experience in Sedimentary Concrete similar to that specified herein and can demonstrate successful experience through past project documentation and references.

C. Demonstration of experience: provide a minimum of four (4) projects of installed Sedimentary Walls totaling at least 50 lineal feet with a reference list of each containing address of installation, contact person and phone number of project's architect or owner's representation. Provide two (2) color photos, 8" x 10" size, of each installation listed above representing the installation. Photo #1 shall show the approximate size of the installation. Photo #2 shall be taken approximately 2 to 3 feet from the wall surface. See submittals portion of this section for additional information.

D. Supervision: On site superintendent must have a minimum of 5 years of experience installing Craftsmen Sediment walls.

E. Quality control to be maintained by licensed installers of Sedimentary Concrete throughout duration of project.

1.6 ACTION SUBMITTALS

A. General: Do not proceed with the construction of the cast-in-place architectural concrete in the project, including fabrication of the formwork, until all samples, product data, mockup and shop drawings have been approved by the Landscape Architect.

B. Product Data: For each type of product indicated, including but not limited to form facing material, form release agent, form ties, reinforcing bar supports, waterproofing admixtures, curing compound, joint fillers and sealants, and cleaning solutions.

C. Samples:

1. Provide samples of each sedimentary aggregates, sand, etc.for inclusion at each lens of the walls.

2. Provide a minimum of three sample “pans” including a range of colors, sand, and aggregate, mixtures based on the sedimentary lens identified in the drawings.

   a. Indicate mix design constituent amounts and type of color, aggregate, and finish/form for each lens in the sample.
   b. Sample pans shall be sized to show the full range of colors and finishes in the wall section.
   c. Approved final sample to serve as basis for site mock-up.

D. Furnish diagrammatic drawings to confirm the different finishes for architectural concrete, the formwork materials, and the profiles, sizes, locations and patterns of reveals, tie holes, rustications, cold joints and similar surface design elements. Include elevations and section details to indicate the completed concrete.

E. Formwork Shop Drawings

1. Submit drawings showing the layout and details of formwork for the work
2. Drawings shall include plans, elevations and sections to show layout of all exposed-to-view concrete work and interfacing adjacent concrete work and will include all walls, soffits, stairs, cast-in items, depressions, openings, recesses, reveals, ties, control joints, construction joints and water-stopped joints; all dimensioned with reference to the dimensions shown on the Drawings. Drawings shall be in a minimum ¼”=1’-0”scale.
3. Shop drawings shall include the following details:
   a. Details of shop assembly of formwork and field assembly of construction and control joints, reveals, recesses, embedments, ties, back-up, clean out panels.
   b. The means to be used to seal all joints, including back up bracing, dry ties and brackets.
   c. The means to be used to maintain alignment, including back-up bracing, etc.
   d. Cover of all concrete over reinforcing steel.
   e. Location of clear placing passages through the steel reinforcing for placing trunks and gremmies, sleeves and conduit.
   f. All vertical and horizontal dimensions of wall including reveals, formwork joints, lighting & conduit, and any other accessories.

F. Statement of Mix Design: Submit (1) copy of Statement of Mix Design prepared by batch plant servicing Project for each load delivered to Project. Statement of Mix Design to contain following information:

1. Name, address, and telephone number of batch plant preparing statement of mix design.
2. Date of mix design.
3. Project location.
4. Contractor requesting load delivery.
5. Mix design number.
6. Integral color used.
7. Gradations for sand and aggregate.
8. Material weights, specific gravity, and absolute volumes.

9. Basis of testing, i.e. UBC 2605 D4 and Title 24 2604 D4.
10. Water/cement ratio.
11. PSI rating.
12. Signature of testing laboratory manager.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. Installer: See Quality Assurance Section.
2. Ready-mix concrete manufacturer
3. Testing Agency: Include copies of applicable ACI certificates

B. Materials Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials
2. Aggregates
3. Admixtures
4. Curing Compounds
5. Bonding Agents and Adhesives
6. Joint-filler Strips
7. Concrete Mix Designs

1.8 MOCK-UPS

1. After all samples, product data, and the shop drawings are approved construct a full-scale mock-up as identified in the plans.
2. Obtain approval of location and orientation of mock-up and approval of mock-up formwork shop drawings and products from Resident Engineer before mock-up formwork construction.
3. Coordinate construction of mock-up with other site work as required.
4. Mock-up shall consist of the following :
    a. Cast one corner segment including cabinet opening as shown in the plans.
    b. Use approved form face material, reinforcement and accessories and assemble formwork as intended for the building construction.
    c. Mock-up shall demonstrate all conditions including corners, top, sides, form seam lines, joints and reveals.
5. If Mock-up is not approved by the Landscape Architect, remove and replace with new Mock-ups at no additional cost to the Owner.
6. Final approved mock-up will serve as the standard for quality, finish and design for all future related architectural site concrete work and shall not be removed until all work in place has been completed and approved.

1.9 PERFORMANCE REQUIREMENTS

A. Responsibility for the design of Cast-in-Place Architectural Concrete in conformance with the requirements of the drawings and specifications and performed using the highest standards of quality for visual and durable concrete rests with the Contractor.

B. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."

2. Design formwork to limit deflection of form-facing material to limit deflection of form-facing material, studs, and walers to 0.0025 times their respective clear spans (L/400).

C. Design of the mix and formwork shall be performed by Contractor.

D. Performance Criteria: All cast-in-place architectural concrete formwork shall be performed so that no evidence of the following will be evident when the concrete is subject to imposed loads, temperature and weather conditions:

1. Damage of any kind.
2. Formwork fastening penetrations or formwork anchoring devices or projections other than approved form ties and specified embedded items.
3. Cracking, other than at control joints, due to improper forming and placing.
4. Out of alignment or incorrect profiles.
5. Voids, sand pockets or discoloration due to fluid loss through the formwork.
6. Rock pockets and honeycombs that are not consistent with the approved mockup.
7. Discoloration caused from formboard staining and from improper placing of the concrete.

E. If any of the above-mentioned deficiencies occur, the Landscape Architect may order the affected concrete replaced or repaired with acceptable concrete. Repair only when directed by the Landscape Architect. Corrected deficiencies must meet with the Landscape Architect’s approval.

1.10 WARRANTY

A. Provide standard warranty with a duration of one (1) year in accordance with General Conditions. Warranty shall be in writing and shall warrant work under this Section to be free from defects for the period stipulated.

1.11 COORDINATION

A. Notify Resident Engineer and contractors performing work related to installation of Contractor’s Work in ample time, so as to allow sufficient time for them to perform their portion of work.

B. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, lighting fixtures, drain lines, foam infill, drain grates and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified below.
    a. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
        1) APA Plyform Class I, B-B or better; mill oiled and edge sealed.

B. Form Ties and Spreaders:

1. Form Ties: Shall be manufactured specifically for use as concrete ties and shall be designed to seal tightly to the form face material without fluid loss. Ties shall be of sufficient strength to resist fluid concrete placing pressures at the longest span of support used in project. Ties shall be one of the following as selected by the Landscape Architect during mock-up review:
    a. Cone/Tube/Rod or Cone/Coil/Rod tie system with screw tie clamps. Cone size shall be maximum 1” diameter.
    b. Tapered He-bolt/Stud tie. Size of stud at contact face shall be 5/8” in diameter.
    c. Ties shall be as supplied by Engineered Devices Corp., Ridgefield Park, NJ. Ties: RJD Industries, Inc.: Supertie, Fiberglass Formtie System from RJD Industries - 800-344-4753; or approved equal.
    d. Alternate DywiDag Tie Holes: Atlas Construction Supplies Bob Wigman 858-277-2100 (If specified in architectural requirements); or approved equal.
    e. Spreaders: Same as ties, cut to wall thickness.
    f. Spreader Clips: Proprietary clip to position spreaders adjacent to ties.
    g. Review placement of all above-grade form ties locations with Landscape Architect prior to installing into formwork.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

F. In-Form Retarder: Acceptable Products

1. Architectural Concrete Chemicals, LLC; Altus (301)336-9300 or https://www.acchemicals.com/products/in-form-retarders/
2. GCP Applied Technologies; Pieri® Euro-tard™ (877) 423-6491or https://gcpat.com/en/solutions/products/pieri-decorative-solutions/pieri-euro-tard-form-retarder

2.2 STEEL REINFORCEMENT AND ACCESSORIES

A. General: Comply with CTSS Section 52 for steel reinforcement and other requirements for reinforcement accessories except as modified herein.

B. Reinforcing Bars: ASTM A615/A615M, Grade 60

C. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

D. Joint Dowel Bars: ASTM A615/A615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place; manufacture according to CRSI's "Manual of Standard Practice."

F. Where legs of wire bar supports contact forms, use CRSI Class 1, gray, plastic-protected or CRSI Class 2, stainless-steel bar supports.

2.3 CONCRETE MATERIALS

A. General

1. Materials used shall be the same as those submitted and from the same source.

B. Cement

1. Type I, IA, IL, II, IIA, III, IIIA, IV, and V cements, to conform to ASTM C150.
2. The temperature of cement delivered to the plant shall not exceed 150 degrees F.
3. One brand from the same source shall be used for all exposed concrete.
4. There shall be no detrimental reaction between the cement and the aggregates used.
5. Special color and texture is achieved per Craftsmen Sediment Wall system with consent of the design intent of the project.

C. Washed Sand

1. Clean, hard, and durable washed concrete sand, conforming to ASTM C33.
2. Use same sand from single source throughout entire project.

D. Cementitious Materials

1. Fly Ash: ASTM C618, Class F.
2. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
3. Silica Fume: ASTM C1240 amorphous silica
4. Other Pozzolan: ASTM C618, Type N

E. Aggregate

1. Normal Weight Aggregate: ASTM C33

2. Coarse Aggregate: ASTM C33
3. Fine Aggregate: ASTM C33

F. Water: Clean, potable and free of deleterious matter. In addition, conform to ASTM C94 including the optional chemical tests.

G. Finish: Sedimentary Wall finish with custom color, sand, aggregate and other mixes, distributed in lifts as indicated in the Drawings and consistent with samples and mockups.

2.4 ADMIXTURES

A. Integral Concrete Coloring Admixture: Refer to project Shop Drawings and submittals for color type.

B. Air Entrainment Admixtures: Conforming to ASTM C260.
1. Acceptable Manufacturers:
a. Grace Construction Products; Daravair®, (800) 433-0020 or www.graceconstruction.com/concrete/air_entraining.html#daravair.
b. Master Builders, Inc.; Micro-Air®, (800) 628-9990 or www.masterbuilders.com/MB/pub/Product.asp?TypeCat=2&ParentID=78&ProductID=22.

C. Water Reducing Admixtures: Conforming to ASTM C494, Type A.
1. Acceptable Manufacturers:
a. Grace Construction Products; WRDA® (800) 433-0020 www.graceconstruction.com/concrete/water_reducers.html#wrda.
b. Master Builders, Inc.; Micro-Air® (800) 628-9990 or www.masterbuilders.com.

D. Shrinkage Reducing Admixtures: Conforming to ASTM C157.
1. Acceptable Manufacturers:
a. Grace Construction Products; Eclipse® (800) 433-0020 or www.graceconstruction.com/concrete/shrinkage_reducers.html#eclipse.
b. Eclipse® Shrinkage Reducing Admixture is a liquid admixture which dramatically reduces concrete shrinkage and curling due to drying.

E. Integral Concrete Coloring Admixture: Refer to drawings for color type and manufacturer.
1. Acceptable Manufacturers:
a. L.M. Scofield: (800) 800-9900
b. Colorfull by Admixtures, Inc.: (626) 357-3263
c. QC: (800) 453-8213
d. Davis Color: (323) 269-7311
e. Solomon Colors: (800) 624-0261

B. ASR Admixture

1. Use ASR admixture when utilizing white cement and embedding reactive materials.
2. Acceptable Manufacturers:
a. Sika Corporation; Sika Control 75® (800) 933-SIKA or usa.sika.com
b. BASF; Masterlife ASR 30® (800) 628-9990 or https://www.master-builders-solutions.basf.us

c. Euclid; Eucon Integral ARC (800)321-7628 or https://www.euclidchemical.com
d. GCP Applied Technologies; Rasir® (877) 423-6491

2.5 CONCRETE MIXTURES GENERAL

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

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
5. Use permeability-reducing admixture in concrete mixtures where indicated.

C. Final mix design will be approved during mock-up review.

D. Water content in mix must not exceed what is specified in approved mix design.

2.6 CONCRETE MIXTURES

A. Normal-weight concrete used for walls, footings, grade beams, and tie beams.

1. Minimum Compressive Strength: 4000 psi at 56 days
2. Maximum Aggregate Size: 1"
3. Air Content: Maintain range permitted by ACI 301

2.7 CONCRETE MIXING

A. Clean equipment used to mix and deliver cast-in-place architectural concrete to prevent contamination from other concrete.

B. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish batch ticket information.

2.8 MISCELLANEOUS MATERIALS

A. Joint Sealing Materials: Per approved sample.

1. Meet ASTM C920, Type S (single-component), Low-VOC, cold-applied, elastomeric polyurethane Joint Sealant for exterior applications
2. Color: Submit color chart to Landscape Architect for approval

B. Patching Additive:

1. If patching is approved by Landscape Architect, submit material to be used for review followed by a mock-up review on a below grade or back of wall section.

PART 3 - EXECUTION

3.1 PRE-CONSTRUCTION MEETING

A. At least 3 months prior to commencement of concrete work, meet at the project site to review methods and sequence of concrete construction, standard of workmanship, material selection, testing and quality control requirements, detailed requirements of the design mixes, placement procedures, off-site batching requirements, coordination of the work with other trades and other pertinent topics related to the work. Meeting shall include the following:

1. Resident Engineer
2. Landscape Architect
3. Construction Manager
4. Concrete Sub-contractor
5. Any other subcontractor and/or material supplier or manufacturer required.

3.2 FORMWORK

A. Comply with ACI 301 (ACI 301M).

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M) and to comply with the Surface Finish designations in the drawings.

C. Limit concrete surface irregularities as follows:
1. Surface Finish-3.0: ACI 117 Class A, 1/8 inch (3.0 mm).

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
2. Install keyways, reglets, recesses, and other accessories, for easy removal.

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

G. At construction joints, overlap forms onto previously placed concrete not less than 12 inches (305 mm)

H. Design formwork for a full liquid head of pressure. The forms shall be completely rigid and strong enough to withstand without deflection, movement or leakage due to the placing pressures that result from rapid filling and vibration.

I. Forms shall be fabricated so the concrete can be adequately placed, vibrated and finished to achieve the specified finishes.

J. Panel Size: According to approved shop drawings.

K. Exposed Form Panel Edges: Seal panel edges with two coats of polyurethane edge seal to prevent moisture penetration, while also taking care not to get paint on faces of panels.

L. Form Ties: Place in center of break-off fin. Caulk formwork to prevent leakage at penetration. To keep form dimension uniform, cut lengths of form tie rod to equal wall thickness and attach them to rod being used as a tie by using RJD's spreader clip. Assure that the end of the spreader also falls into the rustication joint.

M. Foam inserts: Back Fasten laser cut foam inserts to inside face of form and/or use adhesive to attach foam insert.

N. Form Erection:

1. Use only form units where face panels are in undamaged condition. Replace damaged panels as required to maintain surface in a condition to achieve the specified treatment.
2. Use screw type fastening devises to maintain alignment, and to tightly close joints at corners, end forms, square columns and at bulkheads. Apply pressure at joint to resist concrete placing pressure as close to the joint as possible.
3. Construction joints and control joints shall be at locations indicated on the drawings.
4. At corner joints, assembled and disassembled in field, place a gasket in the form joint. Install gasket away from contact edge 1/16" to 1/8".
5. All corners, shall be formed with a tight seal (see item above) and with back-up support secured with screw connectors at sufficient intervals to maintain the seal under placing pressures.
6. Reveals on the exposed form surfaces shall be of the shape, width and depth shown on the drawings.

O. Coating of Forms: Prior to use, all forms shall be coated with the specified form release coating in accordance with the manufacturer's written instructions.

1. Coat evenly and remove excess material from form surface with a damp absorbent cloth.
2. Surface applied with specified release agent shall not be oily to the touch.
3. Do not allow coating to come in contact with previously placed concrete or with reinforcing steel.

P. Inspections:

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.

Q.

3.3 REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch (25 mm), not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318 (ACI 318M).

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches (610 mm), whichever is greater.

2. Stagger splices in accordance with ACI 318 (ACI 318M).

G. Tie Wires: Set wire ties with ends directed into concrete, not toward exposed concrete surfaces. Keep tails as short as practical, so that concrete placement will not force ends to exposed surface.

H. Provide bar supports at exposed face only as absolutely necessary to maintain cover. Use a combination of internal bracing and chairs and ties at concealed face to hold reinforcement securely in position.

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

1. Place joints perpendicular to main reinforcement.

2. Continue reinforcement across construction joints unless otherwise indicated.

J. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

K. Inspections:

1. Steel-reinforcement placement.

3.4 SEDIMENTARY CONCRETE PLACEMENT

A. Installation Procedures:

1. Verify that all forms have met all requirements specified; that reinforcing steel, embedded materials are in place and securely anchored; that forms are absolutely clean and appropriate layers of retarder have been painted into the form to create desired strata and verify the entire preparation has been reviewed by the Architect.
2. Protect all cleaned forms if placing does not commence immediately, covering openings with plastic sheeting.
3. In hot weather, do not allow direct sunlight to heat the forms before casting or during curing to a temperature that will affect required surface presentation.
4. In cold weather do not cast concrete in forms where reinforcement or form surfaces are at temperatures which will affect required placing and curing.
5. Concrete placement into walls, columns, and furnishings shall be by rigid pipe or bucket dropped from the top.
6. Deposit concrete as nearly as practical at its final position but not farther than 5 feet horizontally from the final position.
7. Pump the first layer of the Craftsmen Sediment Wall. Place select aggregates from form face inward to define next lift. The surface can be floated with wood or mag floats. You may introduce dry color pigments on top of the layer. Cavities may be created by laying in heavy sand layers with aggregate followed by the matrix. Repeat the process to complete the wall with the appropriate materials and layers per the approved elevation drawing.
8. Once the final layer is placed, the wall top and surface aggregates are floated and troweled into place, you may spray the horizontal surface with surface retarder or sponge to expose the wall top.
9. The use of vibrators is not recommended, it is best to puddle or spade each layer as the concrete is placed.
10. Strip the forms when the concrete is firm enough to support its own weight. Care shall be taken when stripping the forms so as not to mar the concrete surfaces and edges.
11. Once the forms are removed, the various aggregates and layers may be exposed with a 3,000 psi pressure washer.
12. The entire wall should be cleaned with a high-pressure washer (2500 PSI) at a minimum of 210 degree temperature. Areas exhibiting alkali can be removed with a mild acid concrete cleaner.

3.5 JOINTING

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

B. Install construction joints so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

3.6 CURING AND FORM REMOVAL

A. Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. After initial Craftsmen Sediment Wall installation, spray with approved curing compound per manufacturer’s recommendation.

3.7 FINISHES for FORMED PLACEMENTS

A. All exposed work shall be finished with the approved finishes determined from sample tests on the mock-up. Finishes shall be as specified in the drawings.

B. Minor protruding defects such as fins may require removal. No filling of bug holes. Patching or other filling and surface repairs shall be avoided.

C. Tie Hole Treatment: No Tie Holes in Formwork

3.8 CONCRETE SURFACE REPAIRS

A. Prior to repairing or patching any surface defects in the concrete, review areas and repair process and materials with Landscape Architect or Owner's Representative in the field.

1. Provide a repair mock-up using the process and materials approved by Landscape Architect or Owner's Representative for review and approval prior to initiating site-wide repair work.

B. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

1.2 FIELD QUALITY CONTROL

3.9 PROTECTION

A. Protect all Architectural Cast-in-Place Concrete surfaces from damage of any kind. Pay special attention to surfaces near work of other trades. All Architectural Concrete surfaces shall be free of damage at the time of acceptance. Allowing damage and patching or cleaning at end of project is not acceptable. Protection shall assure protection from paint, oils, rust, stains, impact, or any other kind.

1. Contractor must remove and replace all damaged or stained concrete that can not be repaired or cleaned to an acceptable level per Owner's Representative or Landscape Architect.

END OF SECTION

SECTION 055000

METAL FABRICATIONS AND FINISHES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. General Site Metal fabrications
2. Fasteners, Hardware, etc.
3. Misc. angles, plates, bars, rods and other items not specified in other Sections but shown or required to complete the Work
4. Finishing of Metal Fabrications

B. Related Requirements:

1. Section 033300 Architectural Concrete
2. Section 061063 Exterior Carpentry
3. Section 323300 Site Furnishings

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Non-Shrink Grout.
2. Hardware
3. Paint System data including
   a. Preparation requirements and application instructions.
   b. Indicate VOC content.

B. Shop Drawings: Provide enlarged scaled plans, elevations, sections, details, as required, for review by the Landscape Architect and Structural Engineer, indicating dimensioned fabrication and erection of each type of fabricated metal components and their connections. Show construction including anchorage and accessory items. Furnish templates for anchors and bolts installed under other Sections.

1. Provide templates for anchors and bolts specified for installation under other Sections.

C. Samples:

1. Provide (1) 12-inch by 12-inch sample of Finished 12 gauge stainless steel for cabinet doors prior to completion of Mock-up.

   a. Apply coats on Samples in steps to show each coat required for system.

   b. Label each coat of each Sample.

D. Field-Constructed Mock-up: Provide a complete fabricated sample for all elements noted in drawings. The Mock-up may be accepted as part of the completed work pending review and approval by the Landscape Architect.

1. Complete fabrication and hardware installation in accordance with approved shop drawings.
2. Prepare surfaces and apply specified finishes in accordance with specified requirements.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.3 QUALITY ASSURANCE

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

B. Welding: Qualify procedures and personnel according to the following:

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

C. Final approval of color selections will be based on mockups

1.4 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Finish System Materials: Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F

1.5 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 FERROUS METALS

A. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316L.

B. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36.

D. Machine Screws: ASME B18.6.3.

E. Lag Bolts: ASME B18.2.1.

F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

G. Plain Washers: Round, carbon steel, ASME B18.22.1.

H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.

I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

2.4 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for exterior applications.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

J. Remove sharp or rough areas on exposed traffic surfaces.

K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

L. Grind all welds smooth.

2.6 FINISHES, GENERAL

A. Finish metal fabrications after assembly and prior to installation.

2.7 STEEL FINISHES

A. Manufacturers: Tnemec Company Inc.

B. Paint System

1. Prime Coat: Series 90-97 | Tneme-Zinc or Series 94-H2O | Hydro-Zinc; 2.5 to 3.5 mils DFT

2. Intermediate Coat: Series 1095 | Endura-Shield (Color Dark Bronze) at 3.0 to 5.0 mils DFT

3. Finish Coat: Series 1095 | Endura-Shield (Color Dark Bronze) at 3.0 to 5.0 mils DFT

4. Total DFT: 8.5 to 13.5 mils

5. Stripe-Coat Procedure to Prevent Edge Rusting: Series 1095 | Endura-Shield (Color TBD); brush-applied to all welds, voids, nuts, bolts and sharp edges referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 FINISHING

A. Surface Preparation: Comply with manufacturer's written instructions applicable to substrates and paint systems indicated. All surfaces shall be prepared per SSPC-SP6/NACE No. 3 Commercial Blast Cleaning surface condition to exhibit a dense, angular and uniform surface profile of 1.5 mils minimum, 3.5 mils maximum.

B. Application: Apply paints in accordance with manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint entire exposed surface of metal fabrications and cabinet doors.

3.3 INSTALLING SITE METAL FABRICATIONS

A. Install as indicated in Drawings.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas.

END OF SECTION 055000

SECTION 061063

EXTERIOR CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Picnic Table Tops and Seats (Materials Provided by Owner)
2. BBQ Counter Tops (Materials Provided by Owner)
3. Dumpster Enclosures

B. Related Requirements:

1. Section 033300 “Cast-In-Place Concrete”

1.3 DEFINITIONS

A. Boards: Lumber of less than 2 inches nominal in thickness and 2 inches nominal or greater in width.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Timber: Lumber of 5 inches nominal or greater in least dimension.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Product Data: For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

B. Samples:

1. Lumber

a. 24" Length of each wood type, 1/2 of length with specified finish applied

C. Shop Drawings

1. Provide shop drawings for all custom fabricated elements. Drawings must indicate all materials, mechanical connections, hardware, and dimensions.
2. The review and approval of shop drawings does not relieve the Contractor of the responsibility of ensuring that all detailing and workmanship meet the design intent of the Construction Drawings.

D. Mockups – First Install

1. Mockups are intended to ensure agreement on critical details so that final fabrication is efficient. Contractor to provide first install with all of the critical details for all custom elements listed above and below, including

2. Provide First Install for the following:
   a. Picnic Table Tops and Seats
   b. Dumpster Enclosures

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.6 WARRANTY

A. In addition to manufacturer’s warranties, warrant Work for a period of one year from the date of Substantial Completion for entire Project against defects in materials and workmanship.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.

1. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
2. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 LUMBER

A. Hand select wood free from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.

B. Dimension Lumber:
1. Picnic Table and BBQ Counter Lumber (provided by Owner)
   a. Species: Redwood
   b. Surface: S4S
   c. Size: 3x Per Drawings
   d. Grade: ConHeart
   e. Moisture Content: Kiln Dry
   f. Supplier: Big Creek Lumber
2. Dumpster Enclosure Siding
   a. Species: WRCLA Western Red Cedar,
   b. Surface: Hand split – with straight cut sides - Grapevine
   c. Size: 2.5X – variable width.

3. Dumpster Enclosure Post and Beam
   a. Species: WRCLA Western Red Cedar,
   b. Surface: Sawn
   c. Size: Per Drawings
   d. Grade: Standard Post , NLGA 131c, WCLIB 131c
   e. Moisture Content: Kiln Dry

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

1. Use stainless steel fasteners with hot-dip zinc coating complying with [ASTM A153/A153M or ASTM F2329] unless otherwise indicated.
2. For pressure-preservative-treated wood, use stainless steel fasteners.
3. For redwood and western red cedar, use stainless steel fasteners.

B. Nails: ASTM F1667.

C. Power-Driven Fasteners: ICC-ES AC70.

D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.

E. Carbon-Steel Bolts: ASTM A307 with ASTM A563 hex nuts and, where indicated, flat washers all hot-dip zinc coated.

F. Stainless Steel Bolts: ASTM F593, Alloy Group 1 or 2; with ASTM F594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.

B. Install metal framing anchors to comply with manufacturer's written instructions.

C. Do not splice structural members between supports unless otherwise indicated.

D. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of members or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

E. Securely attach exterior exterior carpentry work to substrate by anchoring and fastening as indicated

F. Use common wire nails unless otherwise indicated. Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads unless otherwise indicated.

G. Locations of other fasteners, such as wood screws, bolts, and lag screws, as Indicated on Drawings.

END OF SECTION 061063

SECTION 12 36 40

STONE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Stone countertops.

B. Related Sections:

1. Section 033300 “Architectural Concrete”
2. Section 055000 "Metal Fabrications"

1.2 REFERENCES

A. ASTM C 119-04: Terminology Relating to Dimension Stone

B. ASTM C 170-90 (1999): Test Method for Compressive Strength of Dimension Stone

C. ASTM C 615-03: Specification for Granite Dimension Stone

D. ASTM C 880-98: Test Method for Flexural Strength of Dimensional Stone

1.3 SUBMITTALS

A. Product Data: For each stone type, stone accessory, and other manufactured products.

1. Each stone type: Physical properties
2. Joint Sealant
3. Stone Sealer

B. Shop Drawings: Include plans, sections, details, and attachments to other work. Show fabrication and installation details:

1. Include dimensions and profiles of stone units.
2. Show locations and details of joints.
3. Show locations and details of anchors and supports.

C. Stone Samples: (2) Sets for each stone required, exhibiting the full range of color characteristics and finishes; not less than 6 inches square.

1. Grout Samples: Full range of exposed color and texture.
2. Sealant Samples: For each type and color of joint sealant required.

D. Sealant Compatibility Test Report: Submit test report from sealant manufacturer stating that sealants will not stain stone.

E. Maintenance Data: Provide maintenance manuals for stone countertops. Include stone-care products recommended by stone source.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Skilled workers who custom-fabricate and install stone countertops similar to work of this Project.

B. Source Limitations for Stone: Obtain each variety of stone from a single quarry.

1. Obtain each variety of stone from a single quarry.
2. Make stone slabs available for Landscape Architect to examine for appearance characteristics.

a. Landscape Architect will select aesthetically acceptable slabs and will indicate aesthetically unacceptable portions of slabs.

C. First Install: Complete First Install to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Complete first install of granite countertops as directed by the Landscape Architect.
2. Approved installation may become part of the completed Work.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of construction to receive stone countertops by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 STONE SOURCE

A. Varieties and Source:

1. Stone: Academy Black by Coldspring Granite, or approved equivalent.

2.2 STONE MATERIAL

A. Granite: ASTM C 615.

B. Cut stone from one block or contiguous, matched blocks in which natural markings occur.

C. Granite Type:

1. Stone Variety: Academy Black by Coldspring, or approved equivalent.
2. Finish:

a. Top of Counter: Diamond 8
b. Exposed Faces: Thermal

3. Thickness: As indicated in plans.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content is not more than 0.1 percent when tested in accordance with ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Colored Portland Cement-Lime Mix
2. Color: Dark Grey-Black based on manufacturer’s standard colors.
3. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.

D. Aggregate for Mortar: ASTM C144.

E. Aggregate for Grout: ASTM C404.

F. Water: Potable.

2.4 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime cement mortar.

B. Mortar for Stone Masonry: Comply with ASTM C270, Proportion Specification. Provide the mortar for applications stated.

1. Type N

C. Pigmented Mortar: Use colored cement product

1. Pigments does not exceed 10 percent of portland cement by weight.
2. Pigments does not exceed 5 percent of masonry cement or mortar cement by weight.
3. Mix to match Architect's sample.
4. Application: Use pigmented mortar for exposed mortar joints

D. Grout: Comply with ASTM C 476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches. Provide one pound of Sika Grout Aid per sack of cement (6 pounds maximum per cubic yard).

2.5 STONE ACCESSORIES

A. Sealant for Countertops: Manufacturer's standard sealant of characteristics indicated below and will not stain the stone it is applied to.

B. Single-component, neutral-curing silicone sealant.

1. Color: As selected by Architect based on manufacturer standard colors.
2. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Stone Cleaner: Cleaner specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.

D. Stone Sealer: Colorless, stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.

2.6 STONE FABRICATION, GENERAL

A. General: Fabricate stone per requirements, including Drawings and Shop Drawings.

1. Granite: NBGQA's "Specifications for Architectural Granite."

B. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.

1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically unpleasing, as judged by Landscape Architect.

C. Grade and mark stone for final locations to produce assembled countertop units with an overall uniform appearance.

D. Fabricate stone countertops in sizes and shapes required to comply with requirements indicated, including details on Drawings and Shop Drawings.

1. Clean sawed backs of stones to remove rust stains and iron particles.
2. Dress joints straight and at right angle to face, unless otherwise indicated.
3. Cut and drill sinkages and holes in stone for anchors, supports, and attachments.
4. Provide openings, reveals, and similar features as needed to accommodate adjacent work.
5. Fabricate molded edges with machines having abrasive shaping wheels made to reverse contour of edge profile to produce uniform shape throughout entire length of edge and with precisely formed arris slightly eased to prevent snipping, and matched at joints between units. Form corners of molded edges as indicated with outside corners slightly eased, unless otherwise indicated.
6. Finish exposed faces of stone to comply with requirements indicated for finish of each type of stone required and to match approved Samples and mockups. Provide matching finish on exposed edges of countertops, splashes, and cutouts.

E. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

2.7 STONE COUNTERTOPS

A. General: Comply with recommendations in MIA's "Dimension Stone - Design Manual."

B. Edge: Straight, slightly eased at top.

C. Joints: Fabricate countertops in sections for joining in field, with joints at locations shown on Drawings and as follows:

1. Joints: 1/32 - 1/16 inch in width.

D. Cutouts and Holes:

1. Undercounter Fixtures: Make cutouts for undercounter fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
2. Counter-Mounted Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations.
3. Fittings: Drill countertops in shop for plumbing fittings, counter mounted soap dispensers, and similar items.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates indicated to receive stone countertops and conditions under which stone countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.2 PREPARATION

A. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives. Allow stone to dry before installing.

3.3 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/16 inch in 48 inches.

B. Variation from Level: Do not exceed 1/8 inch in 96 inches, 1/4 inch maximum.

C. Variation in Plane at Joints (Lipping): Do not exceed 1/64-inch difference between planes of adjacent units.

D. Variation in Line of Edge at Joints (Lipping): Do not exceed 1/64-inch difference between edges of adjacent units, where edge line continues across joint.

3.4 INSTALLATION OF COUNTERTOPS

A. Install countertops over concrete stem walls with stainless steel pins and grout setting bed as indicated in plans.

B. Do not cut stone in field. If stone countertops require additional fabrication not specified to be performed at Project site, return to fabrication shop for adjustment.

C. Set stone to comply with requirements shown on Drawings and Shop Drawings. Shim and adjust stone to location shown. Install countertops with uniform joints of widths shown and with edges and faces aligned.

3.5 ADJUSTING AND CLEANING

A. In-Progress Cleaning: Clean countertops as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.

B. Remove and replace stone countertops of the following description:

1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
2. Defective countertops.
3. Defective joints, including misaligned joints.
4. Interior stone countertops and joints not matching approved Samples and mockups.
5. Interior stone countertops not complying with other requirements indicated.

C. Replace in a manner that results in stone countertops matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.

D. Following installation and after sealants are cured, clean stone countertops using clean water and soft rags.

E. Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's instructions.

END OF SECTION 123640

SECTION 134700

GALVANIC CATHODIC PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. The requirements in this section apply to metallic valves, fittings, appurtenances, and service laterals for with the ductile iron fire water and PVC potable water & irrigation pipelines associated with the Flood Park project located at 215 Bay Rd in Menlo Park, CA.

B. The Contractor shall furnish all materials, install all equipment, provide all labor, and acquire all permits necessary to complete the work shown on the drawings and or/listed below and all other work and miscellaneous items not specifically mentioned but reasonably inferred, including all accessories and appurtenances required for a complete system. The intent of this specification is to provide for a complete, functional cathodic protection system.

C. Unless otherwise indicated, all ductile iron pipe, fittings, and valves shall be bonded and electrically continuous.

D. The work may include, but not limited to, any or all of the following:

1. Cathodic protection with prepackaged anodes of all buried, ductile iron pipe, fittings, valves, and appurtenances associated with the referenced water pipelines.

2. Encasement of all buried ductile iron pipe, fittings, valves, risers and appurtenances associated with the reference water pipeline in polyethylene.

3. Tape wrap of all buried stainless steel pipe associated with the reference water pipelines

4. Tape wrap of all buried copper pipe, fittings, valves, risers and appurtenances associated with the reference water pipelines.

5. Bonding of buried, non-welded ferrous metal pipe joints.

6. Trenching, drilling, and other excavation.

7. Installation of prepackaged anodes, test stations, and cables.

8. Backfill and compaction of backfill.

9. Provide shop drawings, reports, permits, and obtain Engineer's approval where required.

10. Correction of all deficiencies.

11. Cleanup and restoration of surface.

12. The work shall include the provision of all materials, equipment, and apparatus not specifically mentioned herein or noted on the plans, but which are obviously necessary to complete the work specified.

E. The Contractor shall provide all necessary water for use during construction activities at the project sites.

1.2 REFERENCES

A. All material and construction work shall be carried out in conformity with the various applicable local, company, state, national or international standards, including but limited to the following:

1. National Association of Corrosion Engineers (NACE):

   a. SP0169-2013 Standard Practice, Control of External Corrosion of Underground and Submerged Metallic Piping Systems.

   b. SP0286-2007 Standard Practice, Electrical Isolation of Cathodically Protected Pipelines.

2. American Water Works Association (AWWA):

   a. C105/A21.5-05 American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.

3. American Society for Testing and Materials (ASTM):

   a. D-1248-84 Polyethylene Plastics, Molding and Extrusion Materials.

   b. D-1557-78 Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 10-pound Rammer and 18-inch Drop.

   c. A-34-83 Practice for Procurement, Testing and Sampling of Magnetic Materials.

   d. C-94-81 Ready-mixed Concrete.

4. Military Specification (Mil. Spec.):

   a. MIL-C-18480B Coating Compound, Bituminous Solvent, Coal Tar Base.

   b. MIL-A-18279C Anodes, Corrosion Preventative, Impregnated Graphite, Rods and Bars.

5. Underwriter's Laboratories, Inc. (U.L.):

   a. 83-1983 Thermoplastic Insulated Wire.

   b. 486A-1990 Wire Connectors and Soldering Lugs for Use with Copper Conductors.

   c. 510-1986 Insulating Tape.

d. 514A-1983 Outlet Boxes and Fittings.

6. IEEE Regulation for electrical installation.

7. National Fire Protection Code (NFPA 70).

8. National Electrical Code (NEC).

9. National Electrical Manufacturers Association (NEMA):

a. 1-10-1979 Type 3R and 4X Enclosures.

b. TC-2-1983 Electrical Plastic Tubing (EPT) and Conduit (EPC 40 and EPC 80).

10. AASHTO Regulation for heavy traffic rating.

1.3 ACTION SUBMITTALS

A. General: Contractor shall submit administrative, shop drawings, samples, quality control, and contract closeout submittals of all equipment furnished in this Section and in referenced Sections. The Contractor shall submit a complete list of equipment and material, including name and manufacturer, catalog number, size, finish and any other pertinent data necessary for proper identification and to determine conformance with specifications for the following:

1. Prepackaged Anodes

2. Cables

3. Exothermic Weld Equipment and Supplies

4. Coating of Cable-to-Pipe Connection

5. Test Station Components

6. Cable Identification Tags

7. Cable Warning Tape

8. Conduit and Fittings

9. Bitumastic Coating

10. Polyethylene Encasement

11. Tape Wrap of Buried Stainless Steel Pipe

12. Tape Wrap of Buried Copper Pipe

13. Isolating Joint

14. Grounding Clamp

15. Reference Electrode

1.4 NOTIFICATION

A. See Section 3.11 Preliminary System Testing for notification requirements.

1.5 QUALITY ASSURANCE

A. All work shall be performed to the satisfaction of the Engineer.

B. The material and equipment furnished under these specifications shall be only new, highest quality cathodic protection components, and standard products from manufacturers regularly engaged in the manufacture of such products.

C. The Contractor shall not substitute for the specified materials unless approved by the Engineer.

D. Cathodic protection components shall be subject to testing to ensure proper installation and operation. Proper operation of anodes, test leads and all other cathodic protection components shall be tested by the Project Corrosion Consultant, in order to ensure proper installation and operation. The Contractor shall be responsible for correction of all deficiencies identified by the testing and all costs incurred for retesting prior to final acceptance

E. Compaction of backfill for anodes and trenches shall match the existing conditions and shall be approved by the Construction Manager.

F. Qualification of Workmen: Provide sufficient skilled workmen and supervisors who shall be present at all times during execution of the portion of the work involved and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver cathodic protection materials to the Site in original, sealed containers.

B. Replace all anodes with damaged lead wire.

1.7 INTERFERENCE AND EXACT LOCATIONS

A. The Contractor shall coordinate and properly relate this work to the site and to the work of all trades. The general locations of the facilities are shown on the drawings. However, the Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, verify existing conditions in the field, determine the exact locations of existing pipelines and structures and advise the Engineer of any discrepancy that may prevent or

hinder the specified work from being completed. The Contractor shall be solely responsible for location and marking underground structures so as to avoid damage during construction.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall conform to the requirements set forth herein or as designated on the drawings, unless otherwise specified. All materials must be new, free from defects, and shall be of the best commercial quality for the purpose specified. The Contractor shall furnish all necessary items and accessories not shown on the drawings or specified herein, but which are required to fully carry out the specified intent of the work, without additional cost to the District.

2.2 PREPACKAGED MAGNESIUM ANODES

A. Magnesium anodes shall be high potential alloy magnesium anodes with composition and dimensions as indicated below. Each anode shall be cast with a steel core, and the core shall protrude from one end and shall be of sufficient length to permit attachment of a lead wire. Ingots shall conform to ASTM B843 Grade M1C. The Open Circuit voltage of this allow shall be minimum -1.70 volt with respect to a copper-copper sulfate reference electrode.

1. Chemical Composition

a.	Aluminum	-	5.3 – 6.7%
b.	Zinc	-	2.5 – 3.5%
c.	Manganese	-	0.15 – 0.7%
d.	Silicon	-	0.10% Max.
e.	Iron	-	0.003% Max.
f.	Nickel	-	0.002% Max.
g.	Total Impurities	-	0.3% Max. Total
h.	Magnesium	-	Remainder

2. Bare Anode Dimensions

   a. 17 pounds, 4”H x 3.5”W x 25.5”L

   b. 32 pounds, 6”H x 5.75”W x 21”L

B. Anode Core Strap: Galvanized steel, with one end of anode recessed to provide access to the rod for connection of the lead wire.

C. Lead Wire: No. 10 AWG, Type THHN or THWN (Black) silver brazed to the rod, making a mechanically secure connection.

D. Soldered Connection and Core: Seal entirely with electrical potting compound.

E. Magnesium Anode Packaging: Prepackaged in a cloth bag containing low resistivity backfill consisting of 75% hydrated gypsum, 20% bentonite, and 5% sodium sulfate.

2.3 CABLE

A. All underground cables utilized for bonding cables shall be single conductor, stranded copper, Type CP, insulated for 600 volts with High Molecular Weight Polyethylene (HMWPE) in accordance with the requirements of ASTM D1248, Type 1, Class C, Category 5, Grades E-4 and E-5.

B. All cables for galvanic anodes and test stations shall be Type THWN-2, stranded copper, sized as shown on the plans, and shall conform to Federal Specifications JC-30B. All buried test station cables shall be installed in conduit

C. Test Leads and Anode Leads: Extend 18 inches minimum above grade after connection to test station terminal board.

2.4 CABLE-TO-PIPE CONNECTION – DUCTILE IRON PIPE/FITTING

A. Accomplish all cable connections to the ductile iron pipe or fittings utilizing an exothermic welding process, unless shown otherwise in the Design Drawings.

B. Weld Equipment Manufacturers: From one of the following manufacturers, or approved equal:

1. Erico Products, "Cadweld."

2. Continental Industries, Inc., "Thermoweld."

C. Size all materials for welding in accordance with recommendations in manufacturers' literature.

D. Use copper wire sleeves and individual components from one manufacturer when making welds.

2.5 CABLE-TO-PIPE COATING MATERIAL

A. Cable-to-pipe connections and any exposed metallic surfaces, as a result of the cable-to-pipe connection, shall be coated. Coating shall consist of at least one of the following:

1. Plumber’s putty dam positioned around the cable-to-pipe connection and exposed metallic surface(s) and filled with epoxy.

2. A special elastomeric compound in a plastic dome, which is firm enough to resist flow at all normally encountered application and operation temperatures, but soft enough to mold itself around and completely cover the cable-to-pipe connection and associated exposed metallic surface. The minimum dimensions of the Handy Cap are as follows: 4 inch by 4 inch overall, 10 mils minimum sheet thickness, 125 mils minimum tape thickness. Roybond 747 manufactured by Royston Laboratories Division shall be used to prime the exposed metal surfaces and the 4 inch by 4 inch area to be covered by the Handy Cap

B. Subject to Compliance with the Contract Documents the following Manufacturers are acceptable:

1. Durcon-164 by Duriron Company.

2. Scotchcast Resin No. 4 by 3-M Company.

3. CC-1 Potting Compound by PSI Products.

4. Handy Cap by Royston.

5. Or approved equal.

2.6 TEST STATION COMPONENTS

A. Terminal boxes shall be locking type, constructed of high-impact, molded Lexan plastic. The test box shall be provided with sufficient hardware and binding post terminals for each cable as shown on the drawings. All test station hardware, including nuts, bolts and shorting straps shall be nickel plated brass.

1. Cable Terminations: If terminal posts with washers and nuts are utilized, all cables that terminate in the terminal boxes shall have ring type connectors that are sized appropriately for the terminal bolts. The ring connectors shall be either a soldered ring type connection or a heavy duty, compression type crimp connection.

2. If binding post terminals are utilized, ring connectors are not required.

3. Subject to Compliance with the Contract Documents the following Manufacturers are acceptable:

a. Model: T-3 by Tinker & Rasor Company

b. Model: Big Fink by Cott Manufacturing Company

c. Or approved equal

B. Traffic Valve Box: Brooks Type 1RT Traffic Box, or Christy G-5 Traffic Box, or approved equal.

C. Valve Box Covers: Cast iron, with legend "CP TEST" as indicated on Drawings.

D. Shunts: 0.01 ohm, 8 ampere capacity, manganin wire type.

E. Test station concrete pad shall be installed as indicated on Drawings. Top of concrete pad shall be finished with a slope suitable to direct water away from traffic valve box opening.

2.7 CABLES

A. All underground cables utilized for bonding cables shall be single conductor, stranded copper, Type CP, insulated for 600 volts with High Molecular Weight Polyethylene (HMWPE) in accordance with the requirements of ASTM D 1248, Type 1, Class C, Grade 5 and ICEA NEMA S 61 402.

B. All test station cables shall be Type THWN-2, stranded, copper, sized as shown on the plans, and shall conform to Federal Specification JC 30B. All buried test station cables shall be installed in conduit.

C. Cables shall be sized as indicated on Drawings.

2.8 CABLE WARNING TAPE

A. All buried test station and anode cables shall have plastic warning tape installed a minimum of 12 inches above the top of the cables for the entire buried length of the cables. The warning tape shall be 6 inches wide and shall be yellow with black lettering with the legend "CAUTION, CATHODIC PROTECTION CABLES BURIED BELOW" in 4 inch high lettering printed at a minimum of seven foot intervals along the entire buried length of the cable.

2.9 CABLE IDENTIFICATION TAGS

A. All wires and cables shall be properly identified. The identification tag shall be typed on a heat shrinkable tube applied to each end of the wire.

B. The marking shall be a permanent, non-smearing, abrasion and solvent resistant type, similar to Bradey, Raychem TMS, or approved equal.

2.10 RIGID PVC CONDUIT AND FITTINGS

A. Rigid polyvinylchloride (PVC) conduit and fittings shall be Schedule 80, manufactured to NEMA TC-2 and WC-1094 specifications and shall be U.L. approved.

2.11 BITUMASTIC

A. Coating for all buried bolts, nuts and metallic washers of the ductile iron pipe and the copper insulating corporation stops shall be Bitumastic 300M coal tar mastic coating, as manufactured by Carboline or approved equal.

2.12 POLYETHYLENE ENCASEMENT

A. The polyethylene encasement is specified in Section 33 05 19. (V-Bio Enhanced Polyethylene Encasement)

2.13 TAPE WRAP FOR BURIED STAINLESS STEEL

A. The pipe wrap tape system used for wrapping the welded steel pipe shall consist of a geotextile backed 50 mil tape wrap applied over a companion liquid adhesive, and a slip-plan over wrap: The Polyguard 600 liquid adhesive, Polyguard RD-6 tape wrap, and Polyguard SP6 Outerwrap.

2.14 ISOLATING JOINTS

A. Isolating Flanges:

1. Isolating flanges shall be installed to electrically isolate the new water pipeline from existing pipelines and where shown on the Drawings. Each isolating flange set shall consist of a full-face central gasket, a full-length sleeve for each flange bolt, and two isolating washers with two steel washers for each bolt. The ring-type central gasket shall be 1/8-inch thick G-10, having a dielectric constant of 550 volts per mil, minimum. Bolt sleeves shall be minimum 1/32-inch thick G-10, and isolating washers shall be minimum 1/8 inch thick G-10. The complete assembly shall have an ANSI pressure rating equal to or exceeds the pressure rating of the flanges between which it is installed and the pipeline.

B. Isolating Flanged Coupling Adapters:

1. Isolating elements shall be installed to electrically isolate the water pipeline from existing pipelines. The isolating elements shall consist of a full-face central gasket, two sleeves for each end of the flange bolt, and two isolating washers with two steel washers for each bolt. The ring-type central gasket shall be 1/8-inch thick G-10, having a dielectric constant of 550 volts per mil, minimum. Bolt sleeves shall be minimum 1/32-inch thick G-10, and isolating washers shall be minimum 1/8 inch thick G-10. The complete assembly shall have an ANSI pressure rating equal to that of the flanges between which it is installed.

C. Isolating Flexible Coupling:

1. A double boot assembly shall be installed on the flexible coupling to electrically isolate the water pipeline from existing pipelines.

2.15 ISOLATING FLANGE COATING SYSTEM

A. Coatings for buried isolating flanges and isolating couplings shall consist of a four part, non-conductive, petrolatum-based coating system. The four part coating system shall consist of a prime coat as an initial surface preparation to displace moisture on the surface. A fill material

shall be used as required to provide a smooth contour on the surface of the joint. A wrap material shall be used for protection of the substrate. A guard material shall be used as a final coating to provide increased mechanical strength of the coating.

B. The prime coat shall be a petrolatum material with corrosion inhibitors and inert fillers. The material shall be free of acids, alkalies, waxes and resins. The fill coat shall be a Petrolatum material with inert fillers and reinforcing fibers. The wrap coat shall be a non-woven stitch bonded synthetic fabric saturated with a petrolatum material blended with inert fillers and corrosion inhibitors. The guard coat shall be plasticized, self-adhesive PVC tape. The coating material shall be the STAC system as manufactured by Central Plastics or Trenton Wax tape.

PART 3 - EXECUTION

3.1 DELIVERY AND STORAGE

A. All materials and equipment to be used in construction shall be stored in such a manner to be protected from detrimental effects from the elements. If warehouse storage cannot be provided, materials and equipment shall be stacked well above ground level and protected from the elements with plastic sheeting or other method as appropriate.

3.2 GENERAL

A. All materials, workmanship and installation shall conform to all requirements of the legally constituted authority having jurisdiction. These authorities include, but are not limited to, the latest revision of the State of California, Department of Industrial Relations, Division of Industrial Safety, Electrical Orders; The National Electric Code, General Construction Safety Orders of the Industrial Accident Commission; and all other applicable Federal, State, County, or City codes and regulations. Nothing in the drawings or specifications is to be construed to permit work not conforming to these regulations and codes. Where larger size or better grade materials than required by these regulations and codes are specified, the specifications and drawings shall have precedence.

3.3 JOINT BONDING

A. At each anode installation site, bond all buried non-welded, rubber gasket joints, mechanical joints, and fusion-bonded epoxy coated flanges for continuity.

B. Install joint bonds with a wire loop extended above the bonded joint. The overall length of the conductor shall permit sufficient flexibility of each fitting across the joint without transferring any tensile stress to the bond cable.

C. Ensure proper connection of cables to fittings.

D. Coat each fitting where the coating is damaged with a patch kit, as supplied by the pipe coating manufacturer, in accordance with the manufacturer's written instructions.

3.4 EXOTHERMIC WELDS

A. Install exothermic weld connections in accordance with the Drawings.

B. Remove coating materials from the surface over an area just sufficient to make the connection.

C. Clean steel surfaces to white metal by grinding or filing prior to welding the conductor. Resin impregnated grinding wheels are not permitted.

D. Do not bury connections to the structures or piping until the Engineer has inspected the connections and given permission to backfill Connections made in violation of this provision will be rejected.

E. Test exothermic welds for adherence to the pipe and for electrical continuity between the pipe and wires.

F. Use a 16 ounce hammer for testing adherence by striking a blow using a moderate amount of force to the weld. Take care to avoid hitting the wires.

G. All defective welds shall be removed and replaced.

H. All exposed surfaces of copper and steel shall be covered with a minimum thickness of 1/4-inch of insulating material as shown on the drawings or as follows. The exposed metal and surrounding surface shall be cleaned of contaminants and coated with Royston Roybond 747 primer. After the primer has dried, the Royston Handy Cap shall be applied.

3.5 TEST STATIONS

A. Test stations shall be installed at locations designated on the drawings and at all anode installation locations. The terminal end of each cable shall be identified with the structure identification using the permanent cable identification tags. Test stations shall be installed in sidewalks or non-traffic areas for easy access for future testing.

3.6 CABLES

A. Cables buried in the ground shall be installed in Sch 80 PVC conduit with a minimum cover of 30 inches. Each cable run shall be continuous in length and free of joints or splices. Cable splices to extend existing cables shall be limited to those specifically indicated on the drawings. Care shall be exercised during installation to avoid punctures, cuts, and similar damage to insulation. Any damage to insulation during construction shall require replacement of the entire cable length at no additional cost to the Owner. Backfill surrounding the cables and conduit shall be native soil free of foreign materials. Cable warning tape shall be installed 12 inches above the entire buried length of the cable and conduit.

B. Leave a minimum of 18 inches of slack for each conductor at each test station housing. Slack shall be that amount of wire which, when the cover is removed and the wire extended, protrudes beyond the opening of the box or enclosure.

C. Strip insulation from the cable to make metal-to-metal connection to each binding post within the test station terminal box.

3.7 SACRIFICIAL MAGNESIUM ANODES

A. Excavate a hole to a minimum of 3 inches larger than the package sacrificial anode diameter, at least 6 feet deep and a minimum of 3 to 5 feet from the fitting.

B. Excavate the lead wire trench to a minimum depth of 30 inches.

C. Remove plastic or paper bags from the anode before lowering into the hole. The cloth bag is to remain around the anode.

D. Exercise care to preclude damaging the cloth bag and lead wire insulation on the sacrificial anode. Do not lift or support anode by the lead wire.

E. Center the packaged anode in the hole and backfill with native soil free of rocks and other foreign objects.

F. Flood the anode hole with minimum 15 gallons of fresh water when the backfill reaches one foot above the anode.

3.8 FIELD COATING OF BURIED FLANGE HARDWARE

A. All buried nuts and bolts shall be coated with bitumastic. After flange hardware is installed use wire brush, power brush or an abrasive cleaning pad to remove all loose material, dirt and grime from substrate to a minimum cleanliness of SSPC SP2. Apply Bitumastic coating liberally with a medium bristle brush to the extent that all surfaces are completely covered with no bare spots visually evident. Coat exposed surfaces of bolts, washers and nuts, giving special attention to the bottom-side surfaces. Follow the manufacturer's recommendations for drying times required before backfill.

3.9 ISOLATING FLANGE INSTALLATION AND COATING

A. Isolating Flange Installation:

1. All isolating components of the isolating flanged gasket set shall be cleaned of all dirt, grease, oil and other foreign materials immediately prior to assembly. Bolt holes in mating flanges shall be properly aligned at the time bolts and isolating sleeves are inserted to prevent damage to the isolation. The bolts shall be held stationary and the nut shall be tightened to appropriate torque to prevent damage to the isolation. The process shall be repeated for all bolts in the flange. After flange bolts have been tightened, each isolating washer shall be inspected for cracks or other damage. All damaged washers shall be replaced. After assembly, resistance between each bolt and flange shall be measured with an approved ohmmeter, and the minimum resistance shall be 50,000 ohms. Where the isolating joint is assembled in the shop and shipped as a unit, resistance shall be measured in the shop between the flanges and between each bolt and flange and shall meet the above requirements. In addition, the completed assembly shall be tested with a flange isolation tester such as Gas Electronics Model 601, or equal for the integrity of the isolation. In cases where the isolating flange is assembled in the field the completed assembly shall be tested with a flange isolation tester such as Gas Electronics Model 601, or equal, prior to acceptance.

2. All buried isolating joints shall be tested and approved by the Engineer prior to coating and backfilling.

B. Buried Isolating Joint Coating, per AWWA C217:

1. Surface Prep:

a. Surfaces shall be cleaned of all dirt, grease, oil and other foreign materials immediately prior to coating. Remove loose rust, paint and other foreign matter in accordance with SSPC SP2 or SP3.

2. Fill/prime coat:
   a. Wire brush and wipe the surface clean of any loose coating, rust, scale and foreign matter. Then, apply fill/prime coat by hand directly to the surface. On wet surfaces, rub and press firmly to displace moisture and ensure adhesion.

3. Anticorrosion wax-tape wrap:
   a. With a downward-facing starting point, wrap on anticorrosion wax-tape wrap using a 1-inch overlap. On straight pipe, apply slight tension to ensure contact with surface. On irregular surfaces, allow slack so the wrap can be molded into conformity. In either case, press and form the wrap so there are no air pockets or voids under the wrap. Also, press and smooth out the lap seams to ensure they are sealed. After wrapping, rub the entire surface of the wrap to remove any air bubbles and to smooth the surface.

4. "Hard shell" outerwrap:
   a. With only enough tension to keep the slack out, spiral wrap "hard shell" outerwrap with at least a 50 percent overlap. A 2-inch overlap shall be maintained when overlapping one roll with the end of a new roll. Make sure outerwrap is extended out past the new coating on both ends for better anchoring. At the end of the last roll, brush on outerwrap end adhesive to prevent possible unraveling before the wrap has cured.

3.10 COATING STAINLESS STEEL PIPE

A. Surfaces shall be cleaned of all dirt, grease, oil and other foreign materials immediately prior to coating. A prime coating of Polyguard 600 liquid adhesive shall be applied in a uniform coating over the entire surface to be wrapped. The Polyguard RD-6 wrap coating shall be spirally wrapped using a minimum of 1 inch overlap per manufacturer's recommendations. Next install the Outerwrap without any adhesive. The Polyguard SP-6 wrap coating shall be spirally wrapped using a minimum of 1 inch overlap per manufacturer's recommendations.

3.11 GPS COORDINATES

A. The "as-built" GPS coordinates of all components such as test stations, existing and new, junction box, isolating joints, etc. shall be mapped by the CONTRACTOR with sub-meter accuracy and provided in a tabular form.

3.12 PRELIMINARY SYSTEM TESTING

A. The Contractor shall provide Construction Manager two (2) weeks advanced notice prior to installation of any isolating joints. Engineer shall test and approve prior to coating and backfilling buried isolating joints.

B. The Contractor shall provide Construction Manager two (2) weeks advanced notice prior to installation of first "batch of pipeline joint bonding cables. Engineer shall be onsite to witness installation methods and techniques when installing the pipeline joint bonding cables.

C. The Contractor shall provide Construction Manager two (2) weeks advanced notice prior to installation of first “batch” of cathodic protection test stations. Engineer shall be onsite to witness installation methods and techniques when installing the cathodic protection test lead wires to the pipe.

D. The Contractor shall provide Construction Manager two (2) weeks advanced notice to backfilling completion. After pipeline backfilling and prior to paving, the cathodic protection test stations shall be tested by the Engineer. The Contractor shall provide access to all test station lead wires for testing. The Engineer shall notify the Contractor within one (1) week from testing of any deficiencies found for correction by the Contractor.

3.13 SYSTEM COMMISIONING

A. The Contractor shall notify the Construction Manager 1 week prior to installation of any system components, so that inspections can be scheduled if desired by the Construction Manager. Phone messages left with others will not be considered adequate notification. The Contractor shall not backfill any components prior to inspection and approval by the Construction Manager.

B. the Contractor and confirmed to be operational. Once operational, the system shall tested by Engineer, and witnessed by the Construction Manager, or designated representative, to assure conformance with the specifications. Testing shall include a determination of proper installation of each component, adequacy of the anodes, commissioning of the rectifiers, test pipe isolation and electrical continuity, and structure-to-soil potentials. Upon completion of tests, a detailed report shall be submitted describing any deficiencies detected. Any and all deficiencies shall be corrected by the Contractor and site conditions restored prior to final acceptance. All retesting and correction of deficiencies shall be at the Contractor’s expense.

END OF SECTION – 321123

SECTION 220517

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Retain or delete this article in all Sections of Project Manual.

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

C. Contract Documents: Refer to complete set of Contract Documents for requirements that are related to or may affect the work described in this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves with waterstop.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Grout.
5. Silicone sealants.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizing of sleeves, openings, core-drilled holes.
2. Notify Owner’s testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

B. Pre-installation Meetings:

1. Pre-installation Conferences: Contractor to conduct meetings at site with installer and all other trades involved prior to fabrication and start of Work. Familiarize installer with conditions at site and related Work.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
3. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with all applicable requirements of the laws, codes, and ordinances and regulations, authorities having jurisdiction. Obtain necessary approvals from all such authorities.

B. Qualifications:

1. Contractor: Contractor is responsible for quality of the Work.
2. Manufacturer: A firm experienced in successfully producing work similar to that indicated for this Project with sufficient production capacity to produce required units without causing delay in the Work.
3. An installer trained by the manufacturer in the use of the materials and equipment to be employed in the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: Deliver materials in manufacturer’s original packaging with label indicating pertinent information identifying the item.

1. Pertinent Information: Manufacturer’s labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency’s classification marking applicable to Project; curing time, and mixing instructions for multicomponent materials.

B. Storage and Handling Requirements: Store materials in accordance with manufacturer’s instructions in a protected dry location off ground. Do not open packaging nor remove labels until time of installation.

1. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

PART 2 - PRODUCTS

2.1 SLEEVES WITH WATERSTOP

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

1. Advance Products & Systems, LLC.
2. CALPICO, Inc.
3. Metraflex Company (The).

B. Description: Manufactured PVC/HDPE sleeve-type, waterstop assembly made for imbedding in concrete slab.

2.2 SLEEVE-SEAL SYSTEMS

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

1. CALPICO, Inc.
2. Metraflex Company (The).
3. Pipeline Seal and Insulator, Inc.
4. Proco Products, Inc.

B. Description:

1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
2. Designed to form a hydrostatic seal of 20 psig minimum.
3. Sealing Elements: EPDM-rubber links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
4. Pressure Plates: Stainless steel.
5. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Description: Non-shrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.4 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.

1. Standard: ASTM C920, Type S, Grade NS, Class 25, Use NT.

B. Silicone, S, P, T, NT: Single-component, 25, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant.

1. Standard: ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

C. Silicone Foam: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in grade.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete slabs and new slabs are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using silicone sealant, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

3.2 INSTALLATION OF SLEEVES WITH WATERSTOP

A. Install sleeve with waterstop as new slabs are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using silicone sealant, seal the space around outside of sleeves.

3.3 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using waterproof silicone sealant, seal space between top hub of stack-sleeve fitting and pipe.

3.4 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.

B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Concrete Slabs-on-Grade:

a. Sleeves with waterstops.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

2. Concrete Slabs above Grade:

    a. Stack-sleeve fittings.

END OF SECTION – 220517

SECTION 220518

ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Contract Documents: Refer to complete set of Contract Documents for requirements that are related to or may affect the work described in this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.3 DEFINITIONS

A. Existing Piping to Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed and salvaged, or removed and reinstalled.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. BrassCraft Manufacturing Co.; a Masco company.
2. Dearborn Brass.
3. Mid-America Fittings, Inc.

2.2 ESCUTCHEONS

A. One-Piece, Stainless-Steel Type: With polished stainless-steel finish.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel or brass with polished, chrome-plated finish and spring-clip fasteners.

C. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed and exposed-rivet hinge; and spring-clip fasteners.

2.3 FLOOR PLATES

A. Split Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Insulated Piping: One-piece Stainless-Steel Type, with polished stainless-steel finish.
b. Bare Piping in Unfinished Service Spaces: One-piece steel with polished, chrome-plated finish.
c. Bare Piping in Unfinished Service Spaces: One-piece stamped steel or split-plate, stamped steel with exposed-rivet hinge with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping and Relocated Existing Piping: One-piece, floor plate.
2. Existing Piping: Split floor plate.

3.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION — 220518

SECTION 220523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Contract Documents: Refer to complete set of Contract Documents for requirements that are related to or may affect the work described in this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze ball valves (B-1, B-2).
2. Stainless steel ball valves (SSB-1)

B. Related Sections:

1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
3. Division 33 water distribution piping Sections for general-duty and specialty valves for site construction piping.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RPTFE: Reinforced polytetrafluoroethylene

G. RS: Rising stem.

H. SWP: Steam working pressure.

I. WOG: Water, oil, gas.

1.4 ACTION SUBMITTALS

A. All products listed in PART 2 of this section.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set ball valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of valve from single source from single manufacturer.

2.2 STANDARDS

A. Domestic water valves intended to convey or dispense water for human consumption must comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or must be certified to be in compliance with NSF 61 and NSF 372 (by an ANSI-accredited third-party certification body) that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.18 for cast copper solder-joint connections.
3. ASME B16.22 for wrought copper and copper alloy solder-joint connections.
4. ASME B31.9 for building services piping valves

2.3 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:

1. Solder Joint: With sockets according to ASME B16.18.
2. Threaded: With threads according to ASME B1.20.1.

2.4 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze or Stainless Steel Trim (B-1):

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

a. Conbraco Industries, Inc.; Apollo Valves: 77CLF-100-01A Series (77CLF-200-01A Series)
b. Hammond Valve: 8901 (8503)
c. Milwaukee Valve Company: UPBA-400 (UPBA-450)
d. NIBCO INC: T-585(-66)-LF

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded (Soldered).
g. Seats: PTFE, TFE
h. Stem: Stainless Steel.
i. Ball: Chrome-plated brass or Stainless Steel.
j. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. Valves shall be installed in the following locations and as shown on Drawings:

1. On the building incoming water service.
2. On the supply side to every plumbing fixtures.

B. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball valves.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

VALVE SCHEDULE		
APPLICATION		**VALVE SPECIFICATION**
Service	Maximum Press	B-1
Domestic Water (Cold)		
	200 psi, WOG	
	300 psi, WOG	
Copper, 2" & smaller	600 psi, WOG	**X**

END OF SECTION – 220523

SECTION 220529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Contract Documents: Refer to complete set of Contract Documents for requirements that are related to or may affect the work described in this Section.

1.2 SUMMARY

A. Section Includes:

1. Fastener systems.
2. Pipe-positioning systems.

B. Related Sections:

1. Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 ACTION SUBMITTALS

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

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

1. Metal framing systems.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

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

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 FASTENER SYSTEMS

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

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

a. Hilti, Inc.
b. ITW Ramset/Red Head; Illinois Tool Works, Inc.
c. MKT Fastening, LLC.
d. Simpson Strong-Tie Co., Inc.

B. Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

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

a. Cooper B-line; brand of Eaton, Electrical Sector.
b. Empire Tool and Manufacturing Co., Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head; Illinois Tool Works, Inc.
e. MKT Fastening, LLC.

2. Indoor Applications: Zinc-coated or stainless steel.

C. Outdoor Applications: Stainless steel.

2.2 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.3 MATERIALS

A. Aluminum: ASTM B221.

B. Carbon Steel: ASTM A1011/A1011M.

C. Structural Steel: ASTM A36/A36M carbon-steel plates, shapes, and bars; black and galvanized.

D. Stainless Steel: ASTM A240/A240M.

E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.

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

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.

C. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

D. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Install lateral bracing with pipe hangers and supports to prevent swaying.

H. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers,3/4" pipe at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms, and install reinforcing bars through openings at top of inserts.

I. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

3.3 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.4 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.

3. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
4. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
5. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
6. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment of up to 6 inches for heavy loads.
2. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11 split pipe rings.
3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. C-Clamps (MSS Type 23): For structural shapes.
4. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
5. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
6. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
7. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
8. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal Hanger-Shield Inserts: For supporting insulated pipe.

K. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

L. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION – 220529

SECTION 220548

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Contract Documents: Refer to complete set of Contract Documents for requirements that are related to or may affect the work described in this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe-riser resilient supports (Type N).

1.3 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES, OSHPD and/or an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Operation and Maintenance Data: For air-mounting systems to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

PART 2 - PRODUCTS

2.1 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch- thick neoprene (Type N).

1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
2. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

2.2 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch- thick neoprene.

1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

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

3.2 APPLICATIONS

A. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Division 03 Section "Cast-in-Place Concrete" or Division 03 Section 033053 "Miscellaneous Cast-in-Place Concrete."

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

C. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.

D. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

E. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

G. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 221116 "Domestic Water Piping" for piping flexible connections.

3.5 FIELD QUALITY CONTROL

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

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Landscape Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Landscape Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Landscape Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.7 PLUMBING VIBRATION-CONTROL DEVICE SCHEDULE

A. Piping Riser Isolation

1. Piping riser suspended from structure above shall be isolated with Type E hanger.
2. Piping riser supported from floor shall be isolated with Type B mount.
3. Piping riser anchored to structure shall be isolated with Type N anchors.
4. Steel spring deflection shall be a minimum of 0.75”, except in locations where isolators must accommodate pipe expansion, in which case deflection shall be expansion plus and minus 25%.

END OF SECTION – 220548

SECTION 220553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Contract Documents: Refer to complete set of Contract Documents for requirements that are related to or may affect the work described in this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve tags.
5. Warning tags.

1.3 ACTION SUBMITTALS

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

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch or stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

C. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

D. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

E. Fasteners: Stainless-steel rivets or self-tapping screws.

F. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

G. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch or stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass beaded chain.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Piping Color Coding: Painting of piping is specified in Division 09 Section High-Performance Coatings."

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

E. Pipe Label Color Schedule:

1. Domestic Water Piping

    a. Background: Safety green.
    b. Letter Colors: White.

2. Sanitary Waste Drainage Piping:

    a. Background Color: Safety green.
    b. Letter Color: White.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

    a. Cold Water: 1-1/2 inches, round.

2. Valve-Tag Colors:

    a. Cold Water: Natural.

3. Letter Colors:

    a. Cold Water: Black.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION – 220553

SECTION 220719

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Contract Documents: Refer to complete set of Contract Documents for requirements that are related to or may affect the work described in this Section.

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Sanitary waste piping exposed to freezing conditions.
3. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

B. Sustainable Design Submittals:

1. Product Data: For adhesives, mastics, and sealants, indicating VOC content.
2. Laboratory Test Reports: For adhesives, mastics, and sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at pipe expansion joints for each type of insulation.
3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
4. Detail removable insulation at piping specialties, equipment connections, and access panels.

D. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.

1.4 DEFINITIONS (Note: The terms listed below are common to the insulation industry.)

A. Thermal Conductivity (K value): Units of Btu-inch/hour per square foot per degree F.

B. UL GREENGUARD: Provides independent third-party, Indoor Air Quality (IAQ) certification of products for emissions of respirable particles and Volatile Organic Compounds (VOC's), including formaldehyde and other specific product-related pollutants. Certification is based upon criteria used by EPA, OSHA, and WHO.

C. EPA: Environmental Protection Agency.

D. WHO: World Health Organization.

E. ASJ+: All Service Jacket composed of aluminum foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film layer leaving no paper exposed.

F. ASJ: All Service Jacket (no outer film).

G. SSL+: Self-Sealing Lap with Advanced Closure System.

H. SSL: Self-Sealing Lap.

I. FSK: Foil Scrim Kraft; jacketing.

J. PSK: Poly Scrim Kraft; jacketing.

K. PVC: PolyVinyl Chloride.

L. UL GREENGUARD Gold Certification: (formerly known as GREENGUARD Children & Schools Certification) offers stricter certification criteria, considers safety factors to account for sensitive individuals (such as children and the elderly), and ensures that a product is acceptable for use in environments such as schools and healthcare facilities. It is referenced by both The Collaborative for High Performance Schools (CHPS) and the Leadership in Energy Environmental Design (LEED) Building Rating Systems.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

1. Furnish services of installers who have successfully completed manufacturer's installation training. Submit qualification data for manufacturer-trained mechanics.

B. Inspection: Furnish inspection of installed mechanical insulation performed by inspectors who maintain current certification by National Insulation Association or other certified mechanical association. Inspect complete insulation installation to verify that materials and total insulation system has been installed in accordance with contract documents and material manufacturer’s written instructions.

C. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to listed and labeled in accordance with UL 723, or in accordance with ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

D. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Landscape Architect. Use materials indicated for the completed Work.

1. Piping Mockups:

a. One 10-foot section of NPS 2 straight pipe.
b. One each of a 90-degree threaded, welded, and flanged elbow.
c. One each of a threaded, welded, and flanged tee fitting.
d. One NPS 2 or smaller valve, and one NPS 2-1/2 or larger valve.
e. Four support hangers including hanger shield and insert.
f. One threaded strainer and one flanged strainer with removable portion of insulation.
g. One threaded reducer and one welded reducer.
h. One pressure temperature tap.
i. One mechanical coupling.

2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
3. Notify Landscape Architect seven days in advance of dates and times when mockups will be constructed.
4. Obtain Landscape Architect's approval of mockups before starting insulation application.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Landscape Architect specifically approves such deviations in writing.

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

E. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

B. Protect insulation against dirt, water, chemical and mechanical damage before, during and after installation. Do not install damaged insulation and remove it from the project site. Insulation that has become wet shall be considered damaged and replacement is required.

1.8 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.9 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain formaldehyde, asbestos, lead, mercury, or mercury compounds.

C. Glass mineral wool product shall contain a minimum 50% recycled content.

D. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

E. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

F. Insulation materials shall be fire retardant, moisture and mildew resistant, vermin proof, and suitable to receive jackets, adhesives and coatings as indicated.

G. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

H. Glass mineral wool bonded with a bio-based thermosetting resin. Insulation shall be of inert inorganic material, non-corrosive to mechanical surfaces

I. Flexible Elastomeric Insulation (Type FE): Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials. Average thermal conductivity of 0.28 BTU/Hr/Sq.Ft/Deg. F at 75 degrees mean temperature per inch thickness.

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

    a. Aramacell LLC: [AP ArmaFlex] or [ArmaFlex Black Lapseal]
    b. Aeroflex USA, Inc.
    c. K-Flex.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive (Type A5): Comply with MIL-A-24179A, Type II, Class I.

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

    a. Aeroflex USA, Inc.
    b. Armacell LLC.
    c. Foster Brand; H. B. Fuller Construction Products.
    d. RBX Corporation; Rubatex Contact Adhesive.

2. Adhesive: As recommended by flexible elastomeric and polyolefin manufacturer and with a VOC content of 80 g/L or less.
3. Adhesives and sealants shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and

Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Glass Mineral-Fiber Adhesive (Type A2): Comply with MIL-A-3316C, Class 2, Grade A.

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

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Eagle Bridges - Marathon Industries.
    c. Foster Brand; H. B. Fuller Construction Products.

2. Adhesive: As recommended by mineral fiber manufacturer and with a VOC content of 80 g/L or less.
3. Adhesives and sealants shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. Mastics: As recommended by insulation manufacturer and with a VOC content of 50 g/L or less.
2. Mastics shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

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

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Eagle Bridges - Marathon Industries.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

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

    a. Childers Brand; H. B. Fuller Construction Products.

b. Eagle Bridges - Marathon Industries.
c. Foster Brand; H. B. Fuller Construction Products.
d. Knauf Insulation.
e. Mon-Eco Industries, Inc.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White

2.4 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

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

a. Avery Dennison Corporation, Specialty Tapes Division.
b. Compac Corporation.
c. Ideal Tape Co., Inc., an American Biltrite Company.
d. Knauf Insulation.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.5 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

2.6 UNDERSINK ADA PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

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

a. Engineered Brass Company.
b. McGuire Manufacturing.
c. Plumberex Specialty Products, Inc.
d. Truebro.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures,:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Truebro.

2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

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

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified or indicated on the drawings.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.
5. Manholes.
6. Handholes.

3.4 PENETRATIONS

A. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

B. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping".

3.5 AMBIENT SERVICES

A. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier

3.6 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Install insulation in accordance with manufacturer's installation instructions ASTM C1710.

B. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Straight Pipes and Tubes:

1. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation.
2. Install insulation in compression to allow for expansion and contraction.
3. Push insulation onto pipe, do not pull insulation onto pipe.

D. Insulation Installation on Pipe Flanges:

1. Install preformed flange covers manufactured of same material as pipe insulation, when available
2. Install pipe insulation to outer diameter of pipe flange.
3. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

E. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed flange covers manufactured of same material as pipe insulation, when available
2. Install mitered sections of pipe insulation.
3. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

F. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of plain preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure with SSL, if provided. Or apply manufacturers recommended adhesive to the lap and, using a sealing tool, rub down until adhered.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

B. Color: Final color as selected by Landscape Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Landscape Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements. In addition to other specification requirements, all insulation that is wet or has evidence of mold will be considered defective.

E. Defective work will be removed and replaced. Insulation found to have become wet will be considered defective.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Insulate plumbing piping and equipment per local code requirements or local energy requirements, whichever is more stringent.

B. For domestic water piping, insulate all horizontal, vertical and in-wall branch piping (down within wall, and up to fixture rough-in) for cold, hot, and hot water return piping.

C. Insulate plumbing piping and equipment as scheduled on the drawings or in accordance with the following schedule:

PLUMBING INSULATION SCHEDULE				
INSULATION SPEC.	**JACKET SPECIFICATION**	**SERVICE**	**THICKNESS**	**REMARKS**
F1	ASJ	Soil and waste piping where indicated on drawings	1”	
FE, FEP	None	Soil and waste piping where indicated on drawings	1”	
F1	ASJ	Piping with freeze protection	1” unless greater is required in this table.	
FE, FEP	None	Piping with freeze protection	1” unless greater is required in this table.	1-1/2” for pipes over 6”
As Indicated Above	Aluminum	Exterior Piping		

PLUMBING INSULATION SCHEDULE				
INSULATION SPEC.	**JACKET SPECIFICATION**	**SERVICE**	**THICKNESS**	**REMARKS**
As Indicated Above	Stainless Steel	Piping exposed to view in kitchens		
F1	ASJ	Domestic cold-water piping	1” and smaller: 0.5” insulation. Over 1” pipe: 1” insulation.	
FE, FEP	None	Domestic cold-water piping	1” and smaller: 0.5” insulation. Over 1” pipe: 1” insulation.	

3.12 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

3.13 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

3.14 ADA UNDERSINK INSULATION

A. For all lavatory and front-approach sinks designated as ADA accessible on the landscape architectural documents, install protective shields or under sink guards. Coordinate with Landscape Architect as to which if not identified on the drawings.

END OF SECTION – 220719

SECTION 221116

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Contract Documents: Refer to complete set of Contract Documents for requirements that are related to or may affect the work described in this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Piping joining materials.
3. Encasement for piping.
4. Transition fittings.
5. Dielectric fittings.

B. Related Requirements:

1. Division 33 "Site Water Distribution Piping " for water-service piping outside the building from source to the point where water-service piping enters the building.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Pipe and tube.
2. Fittings.
3. Joining materials.
4. Transition fittings.

B. Installers of pressure-sealed joints shall submit proof of manufacturer certification for installation of pressure-sealed joints.

C. Sustainable Design Submittals:

1. Product Data: For solvent cements, adhesive primers, and adhesives, indicating VOC content.
2. Laboratory Test Reports: For solvent cements, adhesive primers, and adhesives, documentation indicating that products comply with the testing and product requirements

of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.".

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and elevations, or Building Information Model (BIM) as indicated in Division 01 drawn to scale, showing items described in this Section and coordinated with all building trades.

B. System purging and disinfecting activities report.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installers of pressure-sealed joints are to be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.6 FIELD CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
2. Do not interrupt water service without Owner's written permission.

PART 2 - PRODUCTS

2.1 CODES AND STANDARDS COMPLIANCE

A. Domestic water piping, tubing, fittings, joints, and appurtenances intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act, with requirements of authorities having jurisdiction, and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14, NSF 61 and NSF 372. Include marking "NSF-pw" on plastic piping.

2.3 COPPER TUBE AND FITTINGS

A. Annealed “Soft” Copper Tube: ASTM B 88, Type K water tube.

B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings. Do not use solder joints on pipe sizes greater than NPS 3.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings. Do not use solder joints on pipe sizes greater than NPS 3.

D. Cast Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends. Do not use solder joints on pipe sizes greater than NPS 3.

E. Wrought Copper Unions: ASME B16.22. Do not use solder joints on pipe sizes greater than NPS 3.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.5 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105/A21.5.

B. Form: Sheet or tube.

C. Material: LLDPE film of 0.008-inch minimum thickness or high-density, cross-laminated PE film of 0.004-inch minimum thickness.

D. Color: Black or natural.

2.6 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

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

a. Cascade Water Works
b. Jay R. Smith Mfg.
c. Viking Johnson
d. Union nut

2.7 SPECIALTY VALVES

A. Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.

B. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.8 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

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

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Matco-Norca.
d. WATTS.
e. Wilkins.

2. Standard: ASSE 1079.
3. Pressure Rating: 150 psig.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

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

   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. Matco-Norca.
   d. WATTS.
   e. Wilkins.

2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: Pressure Rating: 125 psig minimum at 180 deg F .
5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

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

   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.

2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig.
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

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

   a. Elster Perfection Corporation.
   b. Grinnell Mechanical Products.
   c. Matco-Norca.
   d. Precision Plumbing Products.
   e. Victaulic Company.

2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F 1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.

6. Lining: Inert and noncorrosive, propylene.

2.9 FLEXIBLE CONNECTORS

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

1. Flex-Hose Co., Inc.
2. Flexicraft Industries.
3. Flex Pression, Ltd.
4. Flex-Weld, Inc.
5. Hyspan Precision Products, Inc.
6. Mercer Rubber Co.
7. Metraflex, Inc.
8. Proco Products, Inc.
9. Tozen Corporation.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements for excavating, trenching, and backfilling specified in Division 31 Section "Earth Moving." At minimum, backfill shall be free from discarded construction material and debris. Loose earth, free from rocks, broken concrete, frozen chunks and other rubble, shall be placed in the trench in 6-inch layers and tamped in place until the crown of the pipe is covered by 12 inches of tamped earth. The backfill under and beside the pipe shall be compacted for pipe support. Backfill shall be brought up evenly on both sides of the pipe so that the pipe remains aligned.

B. In instances where the manufacturer's installation instructions are more restrictive than those prescribed by the paragraph above, the material shall be installed in accordance with the more restrictive requirement.

C. Unless approved by a registered and licensed structural engineer, trenching installed parallel to footings shall not extend into the bearing plane of a footing or wall. The upper boundary of the bearing plane is a line that extends downward, at an angle of 45 degrees from horizontal, from the outside bottom of the footing or wall.

3.2 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook." All under slab piping shall be Annealed Type K copper with no soldered joints.

C. Install piping as tight to underside of structure or as coordinated prior to installation with all other trades dictated by the general or prime contractor.

D. Unless approved by a registered and licensed structural engineer, building structure shall not be cut, drilled, notched, spliced or altered in any way.

E. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5.

F. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

G. Install shutoff valve immediately upstream of each dielectric fitting.

H. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

I. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic restraint devices.

K. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

L. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

M. Install piping to permit valve servicing.

N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

3.4 INSTALLATION OF TRANSITION FITTINGS

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.5 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures or groups of plumbing fixtures within the same room. Use ball valves for piping NPS 2 and smaller. Use gate valves for piping NPS 2-1/2 and larger.

1. Install shutoff valve on each water supply serving each patient room per IDPH requirements.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

3.6 INSTALLATION OF DIELECTRIC FITTINGS

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

3.7 FLEXIBLE CONNECTOR INSTALLATION

A. Install flexible connectors in suction and discharge piping connections to each domestic water pump and in suction and discharge manifold connections to each domestic water booster pump.

B. Install bronze-hose flexible connectors in copper domestic water tubing.

3.8 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

C. Support vertical piping and tubing at base and at each floor, or as required by prevailing code if such code is more stringent.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper and piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

F. Support horizontal piping within 12 inches of each fitting.

G. Support vertical runs of copper tubing and piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

H. Support piping and tubing not listed in this article according to MSS SP-58 and manufacturer's written instructions.

3.9 PIPING CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Plumbing Fixtures: Cold- water-supply piping in sizes indicated, but not smaller than that required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.

3.10 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Division 22 Section "Identification for Plumbing Piping and Equipment".

3.11 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.12 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Domestic water piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

1. Perform final testing in presence of owner or owner’s representative
2. Prepare reports for tests and for corrective action required.
3. Provide owner documentation indicating successful testing is completed.

3.13 ADJUSTING

A. Perform the following adjustments before operation:

1. Open shutoff valves to fully open position.
2. Open throttling valves to proper setting.
3. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
4. Remove and clean strainer screens. Close drain valves and replace drain plugs.
5. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
6. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.14 CLEANING

A. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

B. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Submit water samples in sterile bottles to authorities having jurisdiction.
    e. Repeat procedures if biological examination shows contamination or as required by authorities having jurisdiction.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

3.15 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be the following:

1. Soft copper tube, ASTM B 88, Type K; rolled changes in direction, no underground joints.

D. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed or soldered joints.

3.16 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION – 221116

SECTION 221119

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Contract Documents: Refer to complete set of Contract Documents for requirements that are related to or may affect the work described in this Section.

1.2 SUMMARY

A. Section Includes:

1. Strainers for domestic water piping.
2. Water-hammer arresters.
3. Flexible connectors.

1.3 DEFINITIONS

A. AMI: Advanced Metering Infrastructure.

B. AMR: Automatic Meter Reading.

C. FKM: A family of fluroelastomer materials defined by ASTM D1418.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For domestic water piping specialties.

1. Include diagrams for power, signal, and control wiring as applicable.

C. Sustainable Design Submittals: "Product Data" Subparagraph below applies to LEED 2009, LEED v4, IgCC, ASHRAE 189.1, and Green Globes for fixtures and equipment that consume water.

1. Product Data: For water consumption.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. For plastic components: NSF 14, mark "NSF-pw" on plastic piping components.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller.
3. End Connections: Threaded for NPS 2 and smaller.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:

    a. Strainers NPS 2 and Smaller: 0.033 inch.

6. Drain: Factory-installed, hose-end drain valve.

2.4 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

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

    a. Jay R. Smith Mfg. Co.
    b. Mifab, Inc
    c. Precision Plumbing Products.
    d. Sioux Chief Manufacturing Company, Inc.
    e. WATTS.
    f. Zurn

2. Standard: Certified ANSI/ASSE 1010-2004 or PDI-WH 201-2017, NSF 372.
3. Type:

    a. Body: Seamless Type-L Copper tube with piston.
    b. Piston: Poly Piston with two EPDM O-Rings.
    c. Piston Lubrication: Dow-Corning, 111 FDA Approved Silicone Compound.
    d. Solder: Lead Free.
    e. Male MIP Thread Fitting.

4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201-2017, Sizes A through F.

2.5 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.
2. Pressure Rating and Temperature: 125-psig minimum pressure rating at 140 deg F.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 1/2 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

B. Welded-Construction Automatic Air Vents:

1. Body: Stainless steel.
2. Pressure Rating: 150-psig minimum pressure rating.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Section 221116 "Domestic Water Piping" for piping joining materials, joint construction, and basic installation requirements.

B. Install Y-pattern strainers for water on supply.

C. Install water-hammer arresters in water piping according to PDI-WH 201.

D. Install air vents at all high points of water piping, including at the top of any rises/falls in horizontal piping. Install drain piping and discharge onto floor drain.

3.2 PIPING CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

C. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION – 221119

SECTION 221316

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Contract Documents: Refer to complete set of Contract Documents for requirements that are related to or may affect the work described in this Section.

1.2 SUMMARY

A. Section Includes:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. Copper tube and fittings.
4. Specialty pipe fittings.
5. Encasement for underground metal piping.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with project requirements for low-emitting materials.

C. Shop Drawings: For hubless, single-stack drainage system. Include plans, elevations, sections, and details.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and elevations, or Building Information Model (BIM) as indicated in Division 01 drawn to scale, showing items described in this Section and coordinated with all building trades.

B. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1.5 FIELD CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

1.6 WARRANTY

A. Listed manufacturers to provide labeling and warranty of their respective products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. See Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment":

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class. All pipe and fittings shall be marked with Manufacturer's Name or Registered Trademark, country of origin, and date of manufacture. Pipe and fittings shall also bear the mark of the National Sanitation Foundation (NSF).

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

D. Tensile Strength: 21,000 psig minimum.

E. Each length of pipe and each fitting shall be plainly marked with size, country of origin, and name of manufacturer, or manufacturer's registered trademark by which the manufacturer can be readily identified after installation.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. B.Tensile Strength: 21,000 psig minimum.

C. All pipe and fittings shall be marked with Manufacturer's Name or Registered Trademark, country of origin, and date of manufacture. Pipe and fittings shall also bear the mark of the National Sanitation Foundation (NSF).

D. Heavy-Duty, Hubless-Piping Couplings:

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

    a. ANACO-Husky.
    b. Charlotte Pipe and Foundry Company.
    c. Mission Rubber Company, LLC; a division of MCP Industries.
    d. Mifab.

2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.5 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L and Type M, water tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Copper Pressure Fittings:

1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

D. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections of same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Unshielded, Non-pressure Transition Couplings:

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

        1) Mission Rubber Company, LLC; a division of MCP Industries.
        2) Fernco, Inc.

    b. Standard: ASTM C1173.
    c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
    d. End Connections: Same size as and compatible with pipes to be joined.
    e. Sleeve Materials:

        1) For Cast-Iron Soil Pipes: ASTM C564, rubber.
        2) For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926 PVC.
        3) For Dissimilar Pipes: ASTM D5926 PVC or other material compatible with pipe materials being joined.

4. Shielded, Non-Pressure Transition Couplings:

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

        1) Mission Rubber Company, LLC; a division of MCP Industries.
        2) Fernco, Inc.

    b. Standard: ASTM C 1460.
    c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
    d. End Connections: Same size as and compatible with pipes to be joined.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:

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

1) A.Y. McDonald Mfg. Co.
2) Capitol Manufacturing Company.
3) Central Plastics Company.
4) HART Industrial Unions, LLC.
5) Jomar Valve.
6) Matco-Norca.
7) WATTS.
8) Wilkins.

b. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 150 psig minimum at 180 deg F.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

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

1) Capitol Manufacturing Company.
2) Central Plastics Company.
3) Matco-Norca.
4) WATTS.
5) Wilkins.

b. Description:

1) Standard: ASSE 1079.
2) Factory-fabricated, bolted, companion-flange assembly.
3) Pressure Rating: 150 psig minimum at 180 deg F.
4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

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

1) Advance Products & Systems, Inc.
2) Calpico, Inc.

3) Central Plastics Company.

b. Description:

1) Nonconducting materials for field assembly of companion flanges.
2) Pressure Rating: 150 psig.
3) Gasket: Neoprene or phenolic.
4) Bolt Sleeves: Phenolic or polyethylene.
5) Washers: Phenolic with steel backing washers.

5. Dielectric Nipples:

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

1) Elster Perfection Corporation.
2) Grinnell Mechanical Products.
3) Josam Company.
4) Matco-Norca.
5) Precision Plumbing Products.
6) Victaulic Company.

b. Description:

1) Standard: IAPMO PS 66.
2) Electroplated steel nipple.
3) Pressure Rating: 300 psig at 225 deg F.
4) End Connections: Male threaded or grooved.
5) Lining: Inert and noncorrosive, propylene.

2.7 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A 674 or AWWA C105/A 21.5.

B. Material: Linear low-density polyethylene film manufactured of virgin polyethylene material conforming to the requirements of ASTM D 1248, and a minimum thickness of 0.008-inch thickness or, high-density, cross-laminated polyethylene film manufactured of virgin polyethylene material conforming to the requirements of ASTM D 1248, and a minimum thickness of 0.004-inch.

C. Form: Sheet or tube.

D. Color: Black or natural.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Division 31 Section "Earth Moving." At minimum, backfill shall be free from discarded construction material and debris. Loose earth, free from rocks, broken concrete, frozen chunks and other rubble, shall be placed in the trench in 6-inch layers and tamped in place until the crown of the pipe is covered by 12 inches of tamped earth. The backfill under and beside the pipe shall be compacted for pipe support. Backfill shall be brought up evenly on both sides of the pipe so that the pipe remains aligned.

B. In instances where the manufacturer's installation instructions are more restrictive than those prescribed by CISPI and the paragraph above, the material shall be installed in accordance with the more restrictive requirement.

C. Unless approved by a registered and licensed structural engineer, trenching installed parallel to footings shall not extend into the bearing plane of a footing or wall. The upper boundary of the bearing plane is a line that extends downward, at an angle of 45 degrees from horizontal, from the outside bottom of the footing or wall.

3.2 PIPING INSTALLATION

A. Unless approved by a registered and licensed structural engineer, building structure shall not be cut, drilled, notched, spliced or altered in any way.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations to layout are approved on coordination drawings.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping as tight to underside of structure or as coordinated prior to installation with all other trades dictated by the general or prime contractor.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.

1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.

    a. Straight tees, elbows, and crosses may be used on vent lines.

3. Do not change direction of flow more than 90 degrees.
4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

    a. Reducing size of waste piping in direction of flow is prohibited.

K. Lay buried building waste piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:

1. Slope of Horizontal Drainage Piping:

Pipe Size	Minimum Slope (Inch per Foot)
3” or Less	1/4”
4” or Larger	1/8”

M. Install standard cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

N. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

O. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.

    a. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.

b. Comply with requirements for cleanouts specified in Division 22 Section "Sanitary Waste Piping Specialties."

2. Install drains in sanitary waste gravity-flow piping.

a. Comply with requirements for drains specified in Division 22 Section "Sanitary Waste Piping Specialties."

P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Q. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

R. Horizontal offsets of drainage stacks shall be vented where 5 or more branch internals are located above the offset. The upper and lower sections of the drainage stack shall be vented and sized per code.

S. Branch vents must rise 6” above the flood level rim of the fixture being vented.

T. The maximum distance between the vent and trap shall be 5 feet.

U. All sanitary offsets shall be vented per local authority.

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Waste Drainage Piping: Unshielded and/or Shielded, non-pressure transition couplings.

a. Use unshielded non-pressure transition couplings for underground non-pressure piping.
b. Use Shielded non-pressure transition couplings for above ground non-pressure piping.

3. In Aboveground Force Main Pressure Piping: Fitting-type transition couplings.
4. In Underground Force Main Pressure Piping:

    a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
    b. NPS 2 and Larger: Pressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric nipples.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
2. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
3. Vertical Piping: MSS Type 8 or Type 42, clamps.
4. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
5. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Install hangers for cast-iron and copper soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

F. Support vertical runs of cast-iron and copper soil piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

G. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Equipment: Connect waste piping as indicated.

    a. Provide shutoff valve if indicated and union for each connection.
    b. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.

B. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.

a. Expose work that was covered or concealed before it was tested.

2. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.

a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
b. From 4 hours before inspection starts to completion of inspection, water level must not drop.
c. Inspect joints for leaks.

3. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.

a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
c. Air pressure must remain constant without introducing additional air throughout period of inspection.
d. Inspect plumbing fixture connections for gas and water leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Perform final testing in presence of owner or owner's representative.
6. Prepare reports for tests and required corrective action.
7. Provide owner documentation indicating successful testing is completed.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Repair damage to adjacent materials caused by waste and vent piping installation.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Dissimilar Pipe-Material Couplings: Transition couplings and/or dielectric fittings as scheduled above.

C. Underground, soil and waste piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Dissimilar Pipe-Material Couplings: Transition couplings and/or dielectric fittings as scheduled above.

D. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:

1. Hubless, cast-iron soil pipe and fittings, CISPI heavy-duty hubless-piping couplings; and coupled joints.
2. Copper Type M tube, copper drainage fittings, and soldered joints.
3. Dissimilar Pipe-Material Couplings: Transition couplings and/or dielectric fittings as scheduled above.
4. Couplings: Transition couplings and/or dielectric fittings as scheduled above

E. Above ground, vent piping NPS 4 and smaller shall be any of the following:

1. Hard copper tube, Type M; copper pressure fittings; and soldered joints (2-1/2” or less only).
2. Hubless, cast-iron soil pipe and fittings; CISPI heavy-duty hubless-piping couplings; and coupled joints.

END OF SECTION – 221316

SECTION 221319

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Contract Documents: Refer to complete set of Contract Documents for requirements that are related to or may affect the work described in this Section.

1.2 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Solids interceptors.

B. Related Requirements:

1. Division 22 Section “Commercial Sinks” for hair interceptors.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. HDPE: High-density polyethylene plastic.

C. PE: Polyethylene plastic.

D. PP: Polypropylene plastic.

E. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rated capacities, operating characteristics, and accessories for the following:

1. FOG disposal systems.

B. Shop Drawings:

1. Show fabrication and installation details for frost-resistant vent terminals.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: For FOG disposal systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For sanitary waste piping specialties to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Cultures: Provide 1-gal. bottles of bacteria culture recommended by manufacturer of FOG disposal systems equal to 200 percent of amount installed, but no fewer than 2 1-gal. bottles.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

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

2.2 CLEANOUTS

A. Exposed Metal Floor Cleanouts:

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

    a. Jay R. Smith Mfg. Co.
    b. Josam Company.
    c. Mifab.
    d. Oatey.
    e. Sioux Chief Manufacturing Company, Inc.
    f. Tyler Pipe; a subsidiary of McWane Inc.
    g. WATTS.
    h. Zurn Plumbing Products Group; Specification Drainage Operation

2. Standard: ASME A112.36.2M for duty, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Heavy-duty, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Required.
7. Outlet Connection: Threaded.
8. Closure: Cast-iron plug.
9. Adjustable Housing Material: Cast iron with threads or setscrews.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Extra Heavy Duty.
13. Riser: ASTM A 74, Extra-Heavy class, cast-iron drainage pipe fitting and riser to cleanout.

2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Air Admittance Valve

1. Standard:
2. ASSE 1050 & 1051,
3. ICC ESR-1664
4. NSF Standard 14
5. IAPMO – Classified Mark
6. ASTM D 2665/D 2661
7. International Plumbing Code (IPC) 2003
8. Tension Membrane: Silicone
9. Sweet Spot: Technology opens at -0.01 psi and seals at 0 psi and above.
10. Screening: Screening on air inlets to guard the seal
11. Grip: Protective sleeve provides grip for installation and keeps valve free from debris
12. Inlet: Opening in bottom of body.
13. Size: Same as connected vent piping.

B. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.4 SOLIDS INTERCEPTORS

A. Solids Interceptors:

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

    a. Josam Company; Josam Div.
    b. Mifab.
    c. Rockford Sanitary Systems, Inc.
    d. Schier Products Company.
    e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    f. Tyler Pipe; Wade Div.
    g. Watts Drainage Products Inc.
    h. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Type: Factory-fabricated interceptor made for removing and retaining **sediment** from wastewater.
3. Body Material: Stainless steel.
4. Interior Separation Device: sediment busket.
5. Interior Lining: Corrosion-resistant enamel.
6. Exterior Coating: Corrosion-resistant enamel.
7. Body Dimensions: 15-1/2”L x 7-1/2” H x 11-1/2” Deep
8. Flow Rate: 35 GPM
9. Inlet and Outlet Size: 2-inch
10. End Connections: Threaded.
11. Mounting: Above floor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting: Install solids interceptors on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases specified in Division 03 Section " Cast-in-Place Concrete."

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct bases to withstand, without damage to equipment, seismic force required by code.
3. Construct concrete bases 4 inches high and extend base not less than 6 inches in all directions beyond the maximum dimensions of solids interceptors, unless otherwise indicated or unless required for seismic anchor support.
4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floor.
5. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
6. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install vent caps on each vent pipe passing through roof.

E. Install solids interceptors with cleanout immediately downstream from interceptors that do not have integral cleanout on outlet. Install trap on interceptors that do not have integral trap and are connected to sanitary drainage and vent systems.

F. Install wood-blocking reinforcement for wall-mounting-type specialties.

G. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CLEANOUTS

A. Every horizontal soil or waste pipe shall be provided with a readily accessible cleanout at every ninety degree (90 Deg.) turn in each junction and at the end of each branch. All floor and wall connections of fixture traps shall be considered cleanouts. An accessible cleanout shall be provided at the foot of each waste and soil stack.

B. House drains or house sewers shall have a cleanout at every change of direction greater than 45 degrees and where more than one change of direction occurs, one cleanout shall be provided every 40 feet.

C. Location of Cleanouts: Cleanouts shall be not more than 50 feet apart, including the developed length of the cleanout pipe, in horizontal drainage lines of four (4) inches nominal diameter or less. Cleanouts shall be not more than 100 feet apart, including the developed length of the cleanout pipe, in horizontal drainage lines of over four (4) inches to 10 inches nominal diameter. Cleanouts shall not be more than 150 feet apart including the developed length of the cleanout pipe in horizontal drainage lines over 10" nominal diameter. For underground drainage lines of over 10 inches nominal diameter, manholes shall be provided and located at intervals of not more than 150 feet.

D. Building sewers shall be provided with cleanout locations located no more than 100 feet apart measured from the upstream entrance of the cleanout. For building sewers 8 inches and larger, manholes shall be provided and located at each change of direction and at intervals of not more than 400 feet.

E. All cleanouts, excepting those installed in floors laid on ground or fill, shall be provided with a flashing clamp ring device.

F. When it is necessary to conceal a cleanout plug, a covering plate or access door shall be provided.

G. A test tee at the base of the stack may be used as a cleanout.

H. Size of Cleanouts. Cleanouts shall be the same size as the pipe they serve up to a maximum four (4) or six (6) inches, and at least four (4) or six (6) inches for larger pipe.

I. Cleanouts shall be installed in locations hereinafter specified and where indicated on the Drawings, in accordance with the following:

1. Floor level cleanouts in all unfinished rooms, shall be J.R. Smith Series 4220 with countersunk plug.
2. Cleanouts extended to grade shall be J.R. Smith Series 4250. Cleanouts shall be set in an 18" x 18" x 18" concrete pad provided by the Plumbing Trade.
3. At exposed to view risers and at end of horizontal exposed to view piping, shall be J.R. Smith Series 4420 bronze plug.
4. At concealed risers, provide J.R. Smith Series 4420 bronze plug and Series 4725 with nickel-bronze cover and frame.

J. All cleanouts, excepting those installed in floors laid on ground or fill, shall be provided with a flashing clamp ring device.

3.3 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Solid interceptor systems.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

1. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections, and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled FOG disposal systems and their installation, including piping and electrical connections, and to assist in testing.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain FOG disposal systems. Refer to Section 017900 "Demonstration and Training."

END OF SECTION – 221319

SECTION 224216.16

COMMERCIAL SINKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Contract Documents: Refer to complete set of Contract Documents for requirements that are related to or may affect the work described in this Section.

1.2 SUMMARY

A. Section Includes:

1. Utility sinks.
2. Sink faucets.
3. Supply fittings.
4. Waste fittings.
5. Supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
2. Include rated capacities, operating characteristics and furnished specialties and accessories.

B. Sustainable Design Submittals:

1. Product Data: For water consumption.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sinks to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to **10** percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to **5** percent of amount of each type and size installed.

1.7 QUALITY ASSURANCE

A. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372 for all components that will be in contact with potable water.

PART 2 - PRODUCTS

2.1 UTILITY SINKS

A. Utility Sinks: Stainless steel, undermounted.

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

a. Advance Tabco.
b. Eagle Group.
c. Elkay Manufacturing Co.
d. Just Manufacturing.

2. Fixture:

a. Standard: ASME A112.19.3/CSA B45.4.
b. Type: Ledge back.
c. Number of Compartments: One.
d. Overall Dimensions: See Drawings.
e. Metal Thickness: 16 Gauge.
f. Compartment:

1) Drain: Grid with NPS 2 tailpiece and twist drain
2) Drain Location: Near back of compartment.

3. Faucet(s): See Drawings.

a. Number Required: One.
b. Mounting: On ledge.

4. Supply Fittings:

a. Standard: ASME A112.18.1/CSA B125.1.
b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

1) Operation: Loose key.
2) Risers: NPS 1/2, ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

5. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Trap(s):

1) Size: [NPS 1-1/2] [NPS 2].
2) Material: Chrome-plated, 17 gauge two-piece, cast-brass trap and swivel elbow with brass tube to wall and chrome-plated brass or steel wall flange.

c. Continuous Waste:

1) Size: NPS 2.
2) Material: Chrome-plated, 17-gauge brass tube.

6. Mounting: undercounter with sealant.

2.2 SINK FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.

B. Sink Faucets: Manual type, single-control mixing valve.

1. Commercial, Solid-Brass Faucets.

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

1) Chicago Faucets; Geberit Company.
2) Elkay Manufacturing Co.
3) T&S Brass and Bronze Works, Inc.
4) Zurn Industries.

2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
4. Body Type: Single hole
5. Body Material: Commercial, Stainless Steel
6. Maximum Flow Rate: 1.8 gpm
7. Handle : Lever.
8. Mounting Type: Deck, exposed.
9. Vacuum Breaker: Required for hose outlet.

10. Spout Outlet: Spray.

2.3 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

F. Risers:

1. NPS 3/8.
2. ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

2.4 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2.
2. Material: Chrome-plated, 17 gauge two-piece, cast-brass trap and swivel elbow with brass tube to wall and chrome-plated brass or steel wall flange.
3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch- thick stainless-steel tube to wall; and stainless-steel wall flange.

2.5 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.

B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.

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

3.2 INSTALLATION

A. Install sinks level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate. Substrate material shall be per carrier manufacturer’s recommendations and installation procedures shall be coordinated and followed accordingly.

C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.

D. Set floor-mounted sinks in leveling bed of cement grout.

E. Install water-supply piping with stop on each supply to each sink faucet.

1. Exception: Use ball valves if supply stops are not specified with sink. Comply with valve requirements specified in Division 22 Section "General Duty Valves for Plumbing.”
2. Install stops in locations where they can be easily reached for operation.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Division 22 Section "Escutcheons for Plumbing Piping."

G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Division 07 Section "Joint Sealants."

H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Division 22 Section "Plumbing Piping Insulation." Coordinate with landscape architectural drawings.

3.3 CONNECTIONS

A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Division 22 Section "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Division 22 Section "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of sinks, inspect and repair damaged finishes.

B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed sinks and fittings.

D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION – 224216.16

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

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

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Industry Reference Standards: The following specifications and standards are incorporated into and become a part of this Specification by Reference.

1. Underwriters' Laboratories, Inc. (UL) Publications:

a. No. 83 Thermoplastic - Insulated Wires
b. No. 486 Wire Connectors and Soldering Lugs
c. No. 493 Thermoplastic - Insulated Underground Feeder and Branch Circuit Cables
d. No. 854 Service Entrance Cables

2. Insulated Cable Engineers Association Standards (ICEA):

a. S-61-402 Thermoplastic Insulated Wire and Cable

3. National Electrical Manufacturer's Standards (NEMA):

a. WC-5 Thermoplastic Insulated Wire and Cable
b. WC-26 Wire and Cable Packaging

4. National Fire Protection Association Publication (NFPA):

a. No. 70 National Electrical Code (NEC)

B. Performance: Conductors shall be electrically continuous and free from short circuits or grounds. All open, shorted or grounded conductors and any other damaged insulation shall be removed and replaced with new material free from defect.

C. Delivery, Storage and Handling: Deliver wire and cable in accordance with NEMA WC-26. Wire and cables shall not be stored in an exterior or unprotected location. Material subject to direct exposure to the elements shall be replaced and removed from the project.

1.6 SUBMITTALS

A. Submittal procedures. Refer to Division 1.

B. Product Data: Submit for building wire and connectors.

1.7 CLOSEOUT SUBMITTALS

A. Execution Requirements: Closeout procedures. Refer to Division 1.

B. Project Record Documents: Record actual locations of components and circuits.

1.8 COORDINATION

A. Administrative Requirements: Coordination and project conditions. Refer to Division 1.

B. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

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

1. Cerro Wire LLC.
2. Encore Wire Corporation.
3. Southwire Company.
4. General Cable Company.
5. Or approved equal

B. Product Description: Single conductor insulated wire.

C. Conductor: Copper

D. Insulation Voltage Rating: 600 volts.

E. Conductor Standing:

1. Solid or stranded for power and lighting wire No. 10 AWG and smaller.
2. Stranded conductors for power wiring No. 8 AWG and larger.
3. Stranded conductors for control wiring, fixture wiring, motor feeders, transformer connections and other connections to vibrating equipment.
4. Solid conductors for wiring connected to side wired wiring devices.

F. Conductor Insulation:

1. Feeders: Type THHN/THWN-2, 600 volt insulation for above grade, interior conductors No. 6 AWG and smaller, routed in conduit.
2. Feeders: Type THHN/THWN-2 or XHHW-2, 600 volt insulation for above grade interior conductors No. 4 AWG and larger, routed in conduit.
3. Feeders Type XHHW-2, 600 volt insulation for conductors routed below grade in exterior locations in conduit.
4. Branch Circuits: Type THHN/THWN, 600 volt insulation, in conduit.
5. Class 1 Control Circuits: Type THHN/THWN, in raceway.
6. Class 2 Control Circuits: Type THHN/THWN, in raceway.
7. Wiring between VFD and Motor Terminal: Stranded TC conductors with XLPE insulation.

G. Conductor Size:

1. Minimum No. 12 AWG for power and lighting except as noted otherwise on the drawings.
2. Minimum No. 14 AWG for control except as noted otherwise on the drawings.
3. Minimum 10 AWG conductors for 20 ampere, 120 volt branch circuit longer than 75 feet.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide connectors and splices by one of the following:

1. Burndy.
2. Gedney/Oz.
3. Ideal.
4. Thomas and Betts.
5. 3M.
6. Or approved equal

B. Manufacturers: Subject to compliance with requirements, provide insulation tape by one of the following:

1. Permacel Model 295.
2. Scotch 3M Model 88.
3. Tomic Model 85.
4. Or approved equal

C. Manufacturers: Subject to compliance with requirements, provide encapsulated insulating kits by one of the following:

1. Essex Group Inc.
2. Raychem.
3. Scotch.
4. Or approved equal

D. Description: UL-listed factory-fabricated connectors and splices of size, ampacity rating, material type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Administrative Requirements: Coordination and project conditions. Refer to Division 1.

B. Verify that interior of building has been protected from weather.

C. Verify that mechanical work likely to damage wire and cable has been completed.

D. Verify that raceway installation is complete and supported.

3.2 PREPARATION

A. Thoroughly swab raceway before installing wire.

3.3 INSTALLATION

A. Route wire and cable as required to meet Project conditions.

B. Install wire and cable in accordance with the NECA "Standard of Installation."

C. Neatly train and lace wiring inside boxes, equipment, and panelboards. Install all wire and cable in conduit or raceway unless otherwise indicated on the drawings.

D. Install conductors only after raceways are complete and permanently in place.

E. Where more than one conductor is being installed in the same raceway, simultaneously pull conductors. Execute cable pulls in one continuous operation.

F. Use pulling means which will not damage the cables or raceways including fish tape, cable rope and basket weave wire/cable grips.

G. Use wire pulling lubricant to ease conductor pulling. Lubricant shall not be of type that deteriorates the conductor insulation or the interior of the associated raceway.

H. Control, communications or signal conductors shall be installed in separate raceway systems from branch circuit or feeder raceway, unless indicated otherwise on the drawings.

I. Conductor lengths for parallel circuits shall be equal. Do not configure isolated phasing in separate conduits for parallel conductors. At each tap of parallel conductors bond all conductors of the circuit together.

J. Install a minimum of twelve inches (300 mm) of slack conductor at each outlet.

K. Do not install more conductors in a raceway than indicated on the drawings. A maximum of three branch circuits are to be installed in any one conduit, on 3 phase 4 wire system, unless specifically indicated otherwise on the drawings.

L. Provide a separate neutral conductor for each branch circuit. No multi-wire circuits shall be installed.

M. Install adequate length of conductors within electrical enclosures for training conductors to terminal points. Bundle conductors larger than No. 10 AWG by individual circuits. Use non-conductive plastic ties to bundle conductors. Electrical tape is prohibited for bundling. Neatly train conductors in panelboards, switchboards, switchgear and other enclosures.

N. Connect all conductors. Torque each terminal connection to the manufacturers recommended torque value. A calibrated torquing tool shall be used to insure proper torque application.

O. Identify and color-code conductors and cables according to Division 26 Section “Identification for Electrical Systems.”

P. Splices:

1. Splices in feeders are not allowed without prior written approval of the Engineer.
2. Splices are permitted only where required to circuit specific devices on shared circuits. Keep to minimum.
3. Install splices and taps that possess equivalent or better mechanical strength and insulation rating than the conductors being spliced.
4. Make all splices and taps in strict conformance with the conductor manufacturer’s recommendations.

Q. Conductor Connections and Terminations:

1. Feeder Terminations: Dual crimp long barrel compression lugs with two bolt holes, suitable for 90 deg C cable, insulated with clear heat shrink molded cover over entire portion of the lug.
2. Feeder Splice: Long barrel compression type splice and tape connectors.
3. Branch Circuit Terminations: Insulated sleeve, crimp-on, ring type terminals.
4. Branch Circuit Splices: Insulated spring wire connectors with molded vinyl cap for wiring #10 AWG and smaller. Insulated sleeve crimp-on type connectors for wiring #8 AWG and larger.
5. Fixture Terminations: Insulated sleeve crimp-on type terminals.

6. Fixture Splices: Insulated spring wire connectors with molded vinyl cap or insulated sleeve crimp-on type splices and joints.
7. Control Wire Terminations and Splices: Insulated sleeve, crimp-on, type splices, terminals, or joints.
8. Insulation: Tape all un-insulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
9. Preparation: Clean conductor surfaces before installing lugs and connectors.
10. Make all splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
11. Approved splices below grade: Made in flush mounted watertight junction boxes with crimped connectors and insulated with watertight resin encapsulating insulation kit.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

2. Insulation Tests: Perform tests as follows:

a. After being pulled in place and before connected, test all service and feeder cable and branch circuit cable in excess of 1/0 with 1000 volt, 60 Hz insulation tester for one minute to determine that conductor insulation resistance to ground is not less than that recommended by the manufacturer. Tests shall not register less than 250 megohm ambient temperature corrected value to ground during an insulation test as described above for service and feeder cables. Remove, replace and retest all cable failing insulation test.
b. Measure insulation resistance of electrical wiring with a self-contained instrument such as a direct-indicating ohmmeter of the generator battery or electronic type.
c. When using any type of d-c voltage source, it is essential that the output voltage is steady to prevent fluctuation in charging current. Where protective resistors are used in test instruments, take into account their effect on the magnitude of the voltage applied to the insulation under test. Properly maintain the instrument used in insulation resistant testing. Make periodic checks to insure that rated voltage is delivered and that the instrument is in calibration.
d. Unless otherwise specified, the insulation resistance shall be approximately 250 megohm for each 1000 volts of operating voltage with a minimum value of 250 megohm.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Remove and replace malfunctioning units and retest as specified above.

3.5 CABLES - LOW-VOLTAGE - 600V MAXIMUM

A. Visual and Mechanical Inspection:

1. Inspect cables for physical damage and proper connection in accordance with single-line diagram.
2. Test cable mechanical connections to manufacturer's recommended values using a calibrated torque wrench.
3. Check cable color coding with applicable engineer's specifications and National Electrical Code standards.

B. Electrical Tests:

1. Perform insulation-resistance test on each feeder on the riser diagram with respect to ground and adjacent conductors. Applied potential shall be 1000 volts dc for 1 minute.
2. Perform continuity test to insure proper cable connection.

C. Test Values: Evaluate results by comparison with cables of same length and type. Investigate any values less than 50 megohms.

END OF SECTION – 260519

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes: Grounding systems and equipment.

B. Section includes grounding systems and equipment, plus the following special applications:

1. Underground distribution grounding.

1.3 SUBMITTALS

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

B. Field quality-control reports.

C. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Instructions for periodic testing and inspection of grounding features at ground rings, grounding connections for separately derived systems based on NETA MTS

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

1.4 QUALITY ASSURANCE

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

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

PART 2 - PRODUCTS

2.1 CONDUCTORS

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

B. Bare Copper Conductors:

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

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 2 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

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

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

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

D. Bus-bar Connectors: exothermic-type.

E. Lug Connection: Compression type, long barrel, two-hole.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

1. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

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

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

1. Bury at least 24 inches below grade.

C. Grounding Bus: Install in electrical equipment rooms and elsewhere as indicated.

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

D. Conductor Terminations and Connections:

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

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

3.3 EQUIPMENT GROUNDING

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

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

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

C. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

D. Nonmetallic Raceways: Install an equipment ground conductor in nonmetallic raceways unless they are designated for telephone or data cables.

3.4 INSTALLATION

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

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

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

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

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

D. Grounding Electrode Conductor: Grounding electrode conductor shall be stranded copper with green insulation.

E. Variable Frequency Controllers (VFC): Each motor with a Variable Frequency Drive controller (VFC) shall have a dedicated grounding conductor. Ground these motors back through the VFC controller as recommended by the drive manufacturer to eliminate radio frequency interference. All wiring between each VFC controller and its respective motor shall be in a dedicated conduit.

3.5 CONNECTIONS

A. General: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to assure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections. Use for the grounding electrode conductor and for all extensions of the grounding electrode conductor. Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding-Wire Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: Where metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors, except as otherwise indicated.

E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

G. Moisture Protection: Where insulated grounding conductors are connected to grounding rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.6 LABELING

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

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

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

D. Prepare test and inspection reports.

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

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Substations and Pad-Mounted Equipment: 5 ohms.

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

3.8 ADJUSTING AND CLEANING

A. Restore surface features, including vegetation, at areas disturbed by work of this Section. Reestablish original grades, except as otherwise indicated. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include top-soiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Division 2 Section “Landscaping.” Maintain restored surfaces. Restore disturbed paving as indicated.

3.9 GROUNDING SYSTEM

A. Visual and Mechanical Inspection:

1. Inspect wiring system outlet and junction boxes for proper grounding. Green grounding conductor shall be connected to outlet and junction boxes. Inspect a minimum of 5% of project boxes.
2. Verify connections of grounds for the secondary of separately derived grounding systems, at dry type transformers. Note type of connection, mechanical or exothermic.
3. Verify proper connection to all components of building service entrance grounding system. Note all system components which are interconnected and type of connection either mechanical or exothermic. Note depth of driven ground rods.

B. Electrical Tests (Small Systems): Perform ground-impedance measurements utilizing the fall-of-potential method per ANSI/IEEE Standard 81 "IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System." Instrumentation utilized shall be specifically designed for ground impedance testing. Provide sufficient spacing so that plotted curves flatten in the 62% area of the distance between the item under test and the current electrode.

C. Electrical Tests (Large Systems): When sufficient spacing of electrodes described above is impractical, perform ground-impedance measurements utilizing either the intersecting curves method or the slope method. (Ref. Nos. 40 and 41 in IEEE Std. 81.)

D. Equipment Grounds: Utilize two-point method of IEEE Std. 81. Measure between equipment ground being tested and known low-impedance grounding electrode or system.

E. Test Values: The main ground electrode system impedance-to-ground should be no greater than five (5) ohms for commercial or industrial systems and one (1) ohm of less for generating stations, transmission stations, and large industrial systems. Equipment grounds, depending on size and length of grounding conductor, should be only fractionally higher than system ground.

END OF SECTION – 260526

SECTION 260533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Metal conduit.

B. PVC coated metal conduit.

C. Flexible metal conduit.

D. Liquidtight flexible metal conduit.

E. Electrical metallic tubing.

F. Nonmetallic conduit - PVC.

G. Fittings and conduit bodies.

H. Outlet boxes.

I. Pull and junction boxes, interior.

1.3 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

C. NECA (National Electrical Contractor’s Association) - "Standard of Installation"

D. NEMA FB 1 (National Electrical Manufacturers Association) - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

E. NEMA OS 1 (National Electrical Manufacturers Association) - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

F. NEMA OS 2 (National Electrical Manufacturers Association) - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.

G. NEMA RN 1 (National Electrical Manufacturers Association) - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

H. NEMA TC 2 (National Electrical Manufacturers Association) - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

I. NEMA TC 3 (National Electrical Manufacturers Association) - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

J. NEMA 250 (National Electrical Manufacturers Association) - Enclosures for Electrical Equipment (1000 Volts Maximum).

K. IEEE C2 - National Electrical Safety Code.

L. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

M. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

N. NEMA TC 6 - PVC and ABS Plastic Utilities Duct for Underground Installation.

O. NEMA TC 9 - Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation.

P. NEMA TC 10 - PVC and ABS Plastic Communications Duct and Fittings for Underground Installation.

Q. NEMA TC 14 - Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings.

R. UL 651A - Type EB and A PVC Conduit and HDPE Conduit.

1.4 SUBMITTALS

A. For all work specified in Division 26, submittals to include Type 1 (Manufacturer’s Name) and Type 2 (Product Data) information. In addition, submittals for the work listed below shall include the indicated type of information.

B. Product Data: Submit for the following Products:

1. Metal conduit.
2. PVC coated metal conduit.
3. Flexible metal conduit.
4. Liquidtight flexible metal conduit.
5. Electrical metallic tubing.
6. Nonmetallic conduit – PVC.
7. Fittings and conduit bodies.
8. Outlet boxes.
9. Pull and junction boxes, interior.

C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include

instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.5 CLOSEOUT SUBMITTALS

A. Execution: Closeout procedures. Refer to Division 1.

B. Project Record Documents:

1. Record actual routing of conduits larger than 1-inch trade size (DN25).
2. Record actual locations and mounting heights of outlet, pull, and junction boxes.
3. Record actual routing and elevations of underground conduit and duct.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Product: Product storage and handling requirements. Refer to Division 1.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

1.7 COORDINATION

A. Coordination and project conditions. Refer to Division 1.

B. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

1.8 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories, Inc. or by a testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.9 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated.

PART 2 - PRODUCTS

2.1 METAL CONDUIT

A. Steel Conduit:

1. Intermediate grade conduit (IMC) and heavy wall galvanized metal conduit (HWG) shall be hot dipped galvanized or electro-galvanized steel.
2. Manufacturers:

    a. Allied.
    b. LTV/Republic.
    c. Steelduct.
    d. Wheatland.
    e. Anaconda.
    f. Triangle PWC.
    g. Or approved equal

3. Rigid Steel Conduit: ANSI C80.1.
4. Conduit that shows corrosion within the 1 year guarantee shall be replaced.

B. Intermediate Metal Conduit (IMC): Rigid steel.

1. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

C. Fittings:

1. Conduit fittings shall be made of steel or malleable iron.
2. Die-cast fittings of pot metal shall not be accepted.
3. Manufacturers: Appleton, Crouse-Hinds/Midwest, OZ/Gedney, Raco, Steel City and T & B.
4. Fittings and Conduit Bodies: ANSI/NEMA FB1; material to match conduit. Fittings to ensure ground continuity.

2.2 FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. Anaconda.
2. American Brass.
3. Electric-Flex Company.
4. ABB Electrification
5. Or approved equal

B. Product Description: Interlocked steel construction.

C. Fittings: NEMA FB 1. Fittings to insure ground continuity.

D. Flexible metal conduit shall be galvanized steel, 1/2" minimum unless otherwise indicated.

2.3 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. Anaconda.
2. American Brass.
3. Electri-Flex Company.
4. ABB Electrification
5. Or approved equal

B. Product Description: Interlocked steel construction with PVC jacket.

C. Fittings: NEMA FB 1.

2.4 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied.
2. LTV/Republic.
3. Steel Duct.
4. Wheatland.
5. Or approved equal

B. Product Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron, compression type as indicated in Part 3.

D. Electric metallic tubing (EMT) “thinwall” conduit shall be hot dipped galvanized or electro-galvanized steel.

E. Conduit that shows corrosion within the 1-year guarantee period shall be replaced.

F. Die cast fittings of pot metal shall not be accepted.

G. Provide insulated throat type connectors.

2.5 NONMETALLIC CONDUIT – PVC

A. Manufacturers:

1. Carlon Electrical Products.
2. Sedco.
3. L.C.P. National Plastics, Inc.
4. Or approved equal

B. Product Description: NEMA TC 2; Schedule80 PVC.

C. Fittings and Conduit Bodies: NEMA TC 3.

2.6 FITTINGS AND CONDUIT BODIES

A. Bushings (1" and Smaller):

1. Manufacturers:

a. Appleton Series BBU50H.
b. Thomas & Betts Series 510.
c. O-Z/Gedney.
d. Or approved equal

2. Bushings for 1" conduit and smaller shall be self-extinguishing thermoplastic type - 150^{o}C temperature rating.

B. Bushings (1-1/4" and Larger):

1. Bushings for 1-1/4" conduit and larger shall be malleable iron body with 105 degree/150 degree insulating ring. Insulating material shall be locked in place and non-removable.

a. Manufacturers:

1) Appleton, Series BU501.
2) OZ/Gedney, Series 1BC-50.
3) ABB Electrification
4) Or approved equal

C. Conduit Seals:

1. Conduit seals shall be filled with compound as recommended by the manufacturer for the specific application.
2. Manufacturers:

a. Adalet.
b. Crouse-Hinds Type EYS or EZS.
c. Appleton ESUF or ESUM.
d. Killark EY or EYS.
e. Or approved equal

D. Expansion Fittings:

1. Provide a suitable expansion fitting as indicated. Fittings shall be complete with bonding jumper and clamps.
2. Manufacturers:

a. OZ/Gedney.
b. Crouse-Hinds.
c. Appleton.
d. ABB Electrification
e. Or approved equal

2.7 OUTLET BOXES

A. Manufacturers:

1. Hubbell Wiring Devices.
2. ABB Electrifications
3. Legrand US
4. Appleton.
5. Or approved equal

B. General Material Requirements:

1. Furnish all materials specified herein.
2. Provide materials specified in this Section that are UL listed and labeled.
3. Provide boxes and conduit bodies sized as required or with minimum sizes as indicated herein, but in no case shall sizes be smaller than as required by Article -314 of the NEC. Boxes for motor terminals shall be sized per NEC Article 430-12. Size pull boxes per NEC Article -314-28.
4. Provide all metal boxes with corrosion resistant galvanizing inside and outside.
5. Round boxes shall not be used where locknuts or bushings are required to be connected to the side of the box.

C. Steel Outlet and Device Boxes:

1. Provide steel outlet and device boxes as follows:

   a. Surface and pendant mounted lighting fixtures: 4" octagon boxes, 1-1/2" deep with male type 1/2" fixture studs. Provide boxes specifically designed for fixture support.
   b. Flush mounted lighting fixtures: 4" square boxes 1-1/2" deep, with blank cover, installed adjacent to fixture. Make connection to fixture with flexible conduit and fixture wire.
   c. Flush switches, receptacles and wall mounted junction boxes in concealed wiring systems: 4" square boxes 1-1/2" deep with square edge tile type cover. Boxes for SPD or GFI receptacles shall be 2-3/4" deep. Attach boxes with caddy series “RSB” or “SGB” mounting brackets.
   d. Surface switches, receptacles and junction boxes in exposed wiring systems mounted below 8’-0” A.F.F. and below access floors: Cast FS boxes with matching device plate. Provide FD box for GFI receptacles.
   e. Individual switches and receptacles flush mounted in exposed concrete block: Single gang masonry boxes 3-1/2" deep.
   f. Boxes installed in poured concrete or cast-in-place: Concrete tight, size as required. Box depth shall allow for 2" minimum of concrete cover.
   g. Devices mounted in metal door jambs: 1-9/16" wide by 1-5/8" deep. Coordinate with door frame and device.
   h. Special purpose devices: Suitable for specific device. Boxes shall be of the same type as those specified above for the installation required.
   i. Outlet boxes shall be galvanized drawn (not welded) steel, knock-out type, with suitable plaster ring and covers on plates.

2. Provide conduit bodies where required as permitted by NEC Article -314. Conduit bodies shall be marked with their cubic inch capacity.

D. Outlet boxes for exposed interior work and all exterior work shall be cast metal or alloy with screw-fastened covers, gaskets and with threaded conduit connections. Fasteners shall be stainless or brass.

E. Cast Boxes: NEMA FB 1, Type FD, cast ferrous alloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

F. Wall Plates for Unfinished Areas: Provide gasketed cover.

G. Unused knockout holes shall remain closed and those opened by error shall be closed with snap in blanks for 2" and smaller. Use Push Penny Plugs for larger than 2". Use threaded plugs for cast boxes.

H. Outlet boxes shall not be smaller than required by code for the number and size of wires to be installed.

2.8 PULL AND JUNCTION BOXES, INTERIOR

A. Manufacturers:

1. Carlon Electrical Products.
2. Hubbell Wiring Devices.
3. ABB Electrification
4. Legrand US
5. Hoffman Enclosures.
6. Or approved equal

B. Provide NEMA 1 enclosures for junction and pull boxes installed indoors, constructed of code gauge galvanized steel. Construct boxes from a single piece of steel with folded and welded corners.

C. Dimensions of pull boxes and junction boxes shall not be less than those dimensions required by the National Electrical Code for the number, size and position of conductors entering the box. Only a single extension ring shall be permitted on a box to increase the volume.

D. Provide pull boxes for installation of vertical conductors with supports for all conductors as required by the National Electrical Code.

E. Provide box covers for all junction and pull boxes.

F. Provide pull boxes installed in finished spaces as flush mounted cabinets with trim, hinged door and flush latch and lock to match panel trim for flush mounted electrical panelboard.

2.9 HINGED COVER ENCLOSURES

A. Manufacturers:

1. Carlon Electrical Products.
2. Hubbell Wiring Devices.
3. Reliance Electric.
4. Hoffman.
5. Or approved equal

B. Construction: NEMA 250, Type 1 or 3R stainless steel enclosure as required per actual location.

C. Box Size: As required in accordance with NEC.

D. Covers: Continuous hinge, held closed by hasp and staple for padlock. Key latch to match project panelboards.

E. Provide interior 1/2" AD plywood primed and painted with fire retardant paint for mounting terminal blocks and electrical components; finish with white enamel.

F. Enclosure Finish: Manufacturer's standard enamel.

2.10 TERMINAL BLOCKS

A. Manufacturers:

1. AMP.
2. Hubbell Wiring Devices.
3. Thomas & Betts.
4. Ideal.
5. Or approved equal

B. Terminal Blocks: NEMA ICS 4.

C. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.

D. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.

E. Provide ground bus terminal block, with each connector bonded to enclosure

PART 3 - EXECUTION

3.1 EXAMINATION

A. Coordination and project conditions. Refer to Division 1.

B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 INSTALLATION

A. Install Work in accordance with Municipality of Menlo Park standards.

B. Install raceway and boxes in accordance with NECA "Standard of Installation."

C. Ground and bond raceway and boxes under provisions of Section 260526.

D. Identify raceway and boxes under provisions of Section 260553.

E. Arrange raceway and boxes to maintain headroom and present neat appearance.

F. Minimum raceway size: 3/4 inch unless otherwise specified.

3.3 INSTALLATION--RACEWAY

A. Raceway Installation: Integral compression fittings are acceptable for sizes 2 ½" through 4".

LOCATION	≤600V.	LOW ENERGY
EXPOSED		
Interior	≤2" EMT compr. ftgs. ≥2.5" RMC compr. ftgs..	EMT compr ftgs.
Exterior	RMC compr. ftgs.	RMC compr. ftgs.
Covered Exterior Areas which are open to the Atmosphere	RMC compr. ftgs.	RMC compr. ftgs.

LOCATION	≤600V.	LOW ENERGY
CONCEALED		
Slab Above Grade	≤1" EMT compr. ftgs. ≥1.25" RMC compr. ftgs.	EMT compr. ftgs.
Walls	≤2" EMT compr. ftgs. ≥2.5" RMC compr. ftgs.	EMT compr. ftgs.
HAZARDOUS LOCATION	RMC compr. ftgs.	RMC compr. ftgs.

LOCATION	≤600V.	LOW ENERGY
POOLS OR FOUNTAINS	Rigid bronze compr. ftgs.	
BELOW GRADE		
Interior	RMC compr. ftgs.	RMC compr. ftgs.
Exterior	Schedule 80 PVC	Schedule 80 PVC

B. Conduit Locations:

1. Conduit size 1” and larger which is serving free-standing equipment may be routed in the ceiling area of the floor below.
2. Exposed conduits which are located below 8’-0” above finished floor (or grade if exterior) and subject to physical damage shall be HWG (heavy wall galvanized metal conduit). Areas which shall be considered as subject to physical damage shall include, but not be limited to, the following:

    a. Mechanical equipment rooms and pump rooms.

3. Conduits size 2” or larger which are routed below a building floor slab which is in contact with earth shall be in 3” concrete encasement.

C. General Installations:

1. Install complete raceway systems including conduit, wireways, and surface raceways. Provide supporting means, boxes and enclosures, and connections to electrical equipment. Install according to manufacturer’s written instructions. Install complete raceway system including boxes prior to installation of conductors or cables.
2. Examine surfaces and locations to receive raceways for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.
3. Cut conduit square using saw or pipe cutter, de-burr and file all sharp edges prior to installation of conductors.
4. Conceal conduits, except in unfinished spaces such as equipment rooms or where indicated by symbol on the drawings. Use a minimum of bends and the shortest practical distance.
5. Install exposed raceways parallel to building walls and floors. Follow surface contours as much as practical.

    a. Run parallel or banked raceways together, or common supports where practical.
    b. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

6. Maintain 6" minimum clearance between raceways and heat sources (flues, heating equipment, appliances, etc.). Install horizontal raceway runs above water and steam piping.
7. Bends:

a. Install no more than the equivalent of four 90 deg. bends between boxes for power raceways.
b. Install no more than the equivalent of three 90 deg. bends between boxes for telephone and data branch raceways less than 2".
c. Install no more than the equivalent of two 90 deg. bends in telephone and data raceways 2" and larger.
d. Use conduit bodies to make sharp changes in direction, as around beams except for telephone and data raceways.
e. Use minimum 10x diameter radius bends in all raceways containing medium voltage cables, communication, data, fiber optic and telephone cables.
f. PVC conduit runs size 2” or larger shall utilize steel conduit at bends which exceed 30º.

8. Provide a No. 14 AWG zinc-coated steel pull wire, 200 pound test monofilament plastic line, or No. 12 AWG insulated conductor in empty conduits. Leave at least 12 inches of slack at each end of pull wire.

    a. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit with one hole galvanized straps, with clamp backs, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.

9. Remove and replace flattened, dented, or deformed raceways.
10. Protect raceways against dirt, plaster, and foreign debris with conduit plugs. Maintain plugs in place until masonry is complete.

    a. Protect conduit stub-ups from damage during construction; damaged conduits shall be replaced. Arrange stub-ups so that curved portion of bends is not visible above the finished slab.

11. Seal conduits originating from outside building envelope, from below grade, entering refrigerated spaces, or entering exterior mounted electrical equipment. Use insulating electrical putty to prevent entrance of moisture. Conduit seals shall be accessible.
12. Install conduits which penetrate roof membranes in accordance with the roof manufacturer’s recommendations and the architectural specifications. Provide a sheet metal pitch pocket filled with asphaltic compound. Route conduits through mechanical roof openings where possible.
13. Use flexible conduit for connections to vibrating equipment, rotating machinery, or connections between junction box and flush mounted light fixtures.

    a. Use a maximum of 6 feet (1830 mm) of flexible conduit for recessed or semi-recessed lighting fixtures.
    b. Use a maximum of 18" (450 mm) of flexible conduit for connection to vibrating or rotating equipment, i.e. motors, transformers, electric duct heaters, unit heaters, busway taps, etc., and to equipment subject to noise transmission.
    c. Use liquid tight flexible conduit for connections to equipment in wet or damp locations and in the kitchen area, laundry area, mechanical equipment rooms, below access floors connecting data processing equipment.
    d. Maintain ground continuity through flexible conduits with green equipment grounding conductors; do not use flexible conduit for ground continuity even if so rated.

e. Use not less than 1/2" trade size flexible conduits unless larger size is required by NEC to meet fill requirements. 3/8" flexible conduit may be used for connection to lighting fixtures provided NEC fill requirements are met.
f. Flexible conduit connections to recessed lighting fixtures in plenum ceilings shall be made with 3/8 inch flexible metallic tubing.
g. Flexible connections, where required, shall be made with flexible steel conduit 1/2" minimum size or sized in accordance with code, except in areas where such connections will be exposed to oil, grease, water, or where installed out of doors. In those areas of adverse exposure, flexible connections shall be made with UL listed liquid tight flexible steel conduit. Grounding conductors with green colored insulation shall be extended through all flexible connections including fixture "whips", and fastened to terminals within the first junction boxes on either side of the flexible length.

14. Provide separate raceway systems for power systems and for control, signal, or communications systems. Do not install control, signal, or communications cables in the same raceways as branch circuit or feeder cables unless specifically indicated on the drawings.
15. Avoid moisture traps where possible; when unavoidable, provide junction box with drain fitting at conduit low point. Drill 1/8" diameter weep hole where necessary.
16. Make bends and offsets so that inside diameter of raceway is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel.
17. Do not install conduits which require the cutting of cross-webs of concrete masonry units. Thread conduits through cells or lower concrete masonry units around conduit. Do not cut horizontal joint reinforcement or bond beam reinforcement for conduit installation.
18. Extend conduits through concrete floor for connection to free standing equipment where required. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; flexible conduit may be used 6 inches above the floor. Install screwdriver - operated, threaded, flush plugs, flush with floor for future equipment connections.
19. Join raceways with fittings designed and approved for the purpose and make joints tight.

    a. Make raceway termination tight. Use bonding, bushings or wedges at connections subject to vibrations. Use bonding jumpers where joints cannot be made tight.
    b. Use insulating bushings to protect conductors.
    c. Tighten set screws of threadless fittings with suitable tools.
    d. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with one locknut, use two locknuts: one inside and one outside the box.
    e. Use threaded hubs for fastening conduits to cast boxes or to sheet metal boxes in damp or wet locations. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipples so no threads are exposed.
    f. No running threads shall be cut or used.

20. Join rigid non-metallic conduit in manner approved by the manufacturer. Apply full even coat of cement to entire area inserted in filling. Allow joints to cure for a minimum of 20 minutes.
21. Apply PVC protective coating material on all metallic conduits in contact with soil.

22. Obtain Architect's approval where conduits must pass through structural members, prior to drilling, for location and size of hole.
23. When a conduit homerun is indicated on the drawings by symbol or by note, provide complete conduit system from the outlet indicated to the termination point indicated.
24. Double locknuts shall be used at termination of conduit in knock-out openings.
25. Raceway routing is shown in approximate locations unless dimensioned. Route as required to complete wiring system and as field conditions dictate.
26. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
27. Maintain adequate clearance between raceway and piping.
28. Maintain 12 inches clearance between raceway and surface with temperatures exceeding 104 degrees F (40 degrees C.).
29. Bring conduit to shoulder of fittings; fasten securely.
30. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
31. Ends of conduits shall be equipped with insulating bushings for 1" and smaller and insulated metallic bushings for 1-1/4" and larger.
32. Provide wall flanges and gasketing on conduits entering fan housings to minimize air leakage at points of penetration.
33. Exposed conduit installed adjacent to ventilating ducts shall be installed after the ducts are in place and shall be run from ceiling or wall junction boxes in such a manner as to retain accessibility to junction box covers and to permit future removal or replacement of ducts.
34. Conduits and other electrical items shall not be fastened to or supported from ventilating ducts but shall be separately supported. The method of supporting and details of the supporting members shall be reviewed by the Architect/Engineer. In no case shall screws penetrate the sheet metal of the ducts.
35. Screws for exterior work shall be stainless steel, unless noted otherwise.
36. Cadmium plated steel screws may be used for interior dry locations only.
37. Ground and bond conduit under provisions of Section 260526.
38. Install PVC coated conduit per manufacturer's instructions. No metal shall be left exposed.

D. Conduit Supports:

1. Provide parts and hardware which are zinc-coated or have equivalent corrosion protection.
2. Provide single hole cast metal type or two-hole galvanized metal type conduit straps.

    a. Provide spring steel type conduit straps for use with exposed structural steel.
    b. Provide spring steel individual conduit straps on metal studs. Straps shall wrap around entire face of stud, securely bite into both edges, and have provisions for screwing into the stud. Size for conduit to be supported. Tie wraps are not acceptable.
    c. Arrange conduit supports to prevent misalignment during wiring installation.

3. Support multiple conduits from metal studs using pre-assembled bar hanger assembly consisting of hanger bar, retaining clips, and conduit straps.
4. Provide 1-1/2" x 1-1/2" x 14 gauge galvanized or equivalent support channels for multiple conduit supports.

    a. Provide 3/8" threaded steel rods for channel suspension.

b. Use swivel type connector to attach suspension rods to structure.
c. Provide steel spring conduit straps compatible with channel.
d. Spring clips are not acceptable. Wire or chain is not acceptable for conduit hangers.
e. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 260529. Provide space on each for 25 percent additional raceways.

5. Provide galvanized spring steel individual conduit hangers specifically designed for that purpose.

   a. Size appropriately for conduit type and diameter.
   b. Provide pre-assembled closure bolt and nut with provisions for receiving threaded hanger rod.
   c. Support with 1/4" threaded steel rod for individual conduits up to 1-1/2" or with 3/8" rods for individual conduits 2" and larger.

6. Refer to Section 260529, Hangers and Supports, for additional material requirements.
7. Group conduits together where possible.
8. Support branch circuiting for lighting systems from ceiling support system only where the ceiling system is designed for this application. Provide additional ceiling support where the lighting branch circuit raceways exceed the suspended ceiling weight design.

   a. Support other conduit systems above suspended ceilings from the building structure.

9. Route conduit in and under slab from point-to-point. Joints in conduit runs in and under slabs on ground shall be made water tight with copper based anti-corrosive conductive compound.
10. Support branch circuit conduits at intervals not exceeding ten feet and within three feet of each outlet box, junction box, cabinet or fitting.
11. Support feeder conduits larger than one inch trade diameter to or from structure on intervals not exceeding 10 feet with conduit beam clamps, one hole conduit straps, or trapeze type support.
12. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports.
13. Do not attach raceway to other piping systems.
14. Exposed conduit surface mounted shall be supported within 3'-0" of each outlet, junction box, or cabinet, by galvanized malleable conduit clamps and clamp backs and in accordance with applicable code authorities. Surface mounted conduits shall be supported every 5'-0" by malleable conduit clamps and clamp backs. Suspended conduits ¾” and smaller shall be supported every 5'-0" by conduit hangers and round rods or, where 2 or more conduits are run parallel, by trapeze hangers suitably braced to prevent swaying.
15. Conduit which is designated to contain 2-hour fire rated cable shall be supported in strict accordance with U.L. FHIT.25 building materials directory for circuit protective systems.

3.4 WIREWAY INSTALLATION

A. Provide NEMA Type 1 wireway in interior dry locations and NEMA 3R for exterior locations.

B. Securely fasten wireways to walls or structure. Support from bottom with factory brackets with 5'-0" maximum intervals. Support each section at minimum two points.

C. Secure hangers on concrete or masonry walls with concrete anchors.

D. Secure hangers on gypsum board walls with toggle bolts or lag screws through studs. Internally reinforce gypsum board walls with channel where wireways are supported.

E. Provide wireways free from open knockouts or unused penetrations.

F. Install a grounding conductor in wireways, sized according to the largest branch circuit or feeder in the wireway. Connect grounding conductor to each section at the welded lug.

3.5 INSTALLATION--BOXES

A. Set wall mounted boxes at elevations to accommodate mounting heights specified in section for outlet device or as indicated.

B. Adjust box location up to 10 feet prior to rough-in if required to accommodate intended purpose.

C. Orient boxes to accommodate wiring devices oriented as specified in Section 262726.

D. Provide box covers secured to all boxes.

E. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

F. Install insulating bushings in all box openings which have conductors passing through them.

G. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

H. Install metallic boxes, enclosures, and cabinets in wet locations such that there is a minimum 1/4" air space between the box, enclosure, or cabinet and the supporting surface.

I. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

J. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches vertical separation. Provide minimum 24 inches vertical separation in acoustic rated walls and in fire rated walls.

K. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

L. Use stamped steel bridges to fasten flush mounting outlet box to each of the adjacent studs.

M. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

N. Use adjustable steel channel fasteners for hung ceiling outlet box.

O. Do not fasten boxes to ceiling support wires or other piping systems.

P. Support boxes independently of conduit.

Q. Use gang box where more than one device is mounted together. Do not use sectional box.

R. Use two gang box with plaster ring for single device outlets.

3.6 OUTLET, JUNCTION, AND DEVICE BOX INSTALLATION

A. Provide an outlet box for two light fixtures or as indicated in the drawings and for each device. Boxes shall not be smaller than indicated in this section of the specifications and shall be larger if required by Article 314 of the National Electrical Code for the number and size of conductors installed. Where lighting fixtures are installed in continuous rows, only one outlet box shall be required.

B. Support boxes in a suspended type ceiling with a threaded rod connected to a structural member.

C. Set outlet boxes for flush mounted devices to within 1/8" of finished wall. Spacers or shims between box and device are not acceptable. In walls and ceilings constructed of combustible materials, boxes shall be flush with finished surface or project slightly therefrom.

D. Repair plaster, dry wall, plaster board, or masonry surfaces so that gaps or open spaces around box or fitting do not exceed 1/8".

E. Provide metal barrier within outlet box to establish two separate compartments where a low voltage device is installed in a common outlet box with a line voltage device.

F. Support every box from structure:

1. Secure to wood with wood screws.
2. Secure to hollow masonry with toggle bolts.
3. Secure to metal with sheet metal screws, machine bolts, or clamps.
4. Anchors for solid masonry and concrete shall be self drilling expansion shields, insert expansion shields, or lead shields with machine bolts. Power actuated pin studs may be used in concrete.
5. Where box is suspended below structure, support from structure with threaded steel rod. Secure rod directly to outlet boxes with double nuts.
6. Hub type cast boxes need not be directly attached to structure if rigid conduit is used and supported in conformance with the NEC.

G. Support outlet boxes for support of surface mounted incandescent lighting fixtures by light weight channel spanning between and attached to main ceiling support member. Attach channel to ceiling support members with galvanized tie wire or nylon tie straps.

H. Do not use outlet boxes for support of fluorescent fixtures; boxes shall be used only as junction boxes.

I. Refer to NEC Article 314-23 for additional box support requirements.

J. Receptacle outlets mounted adjacent to Comm./Data/CATV outlets shall be mounted 6” center-to-center with the adjacent outlet.

3.7 PULL BOX INSTALLATION

A. Install pull boxes only in unfinished spaces or concealed above ceilings, except when indicated on the drawings or approved by the Architect.

B. Installed pull boxes when any of the following conditions apply:

1. Where indicated on the drawings.
2. Where conduit run exceeds 200 ft. from box to box or box to terminal.
3. Where conduit contains more than 4-90 degree bends or the equivalent offsets.
4. To facilitate conductor installation or to insure that the manufacturer’s maximum pulling tension is not exceeded.
5. As described in the “Raceways” section of the specifications for crossing expansion joints.
6. Where conduits cross project demarcation lines such as site to building connections, etc.

C. Rack conductors in pull boxes with any dimension over 6 feet.

D. Support pull boxes securely to building structure. Where box is suspended below structure, support from structure with threaded steel rods. For pull boxes larger than 18" x 18" x 6", construct a 1-1/2" x 1-1/2" x 14 gauge metal channel frame. Connect frame to box by bolting box to frame and securing frame to threaded rod at each corner.

E. Where a pull box is required, one shall be installed for each individual branch circuit conduit or each feeder. It shall contain only the feeder conductors or those conductors in the conduit. A combined pull box for multiple branch conduits or feeders is not permitted, unless approved by the Architect or indicated on the drawings. Where permitted for multiple circuits within pull box:

1. Circuit conductors and feeders shall be individually laced with nylon tie straps of the type with enlarged tab to permit identification of each circuit and feeder within pull box. Identify each with respect to load served.
2. Feeder circuits shall be separated by full height and length sheet metal or polyester resin barrier secured to box by angle brackets.

3.8 CONDUIT BODIES

A. Install where required to facilitate raceway installation. Do not make splices in short radius conduit bodies.

3.9 ADJUSTING

A. Execution Requirements: Testing, adjusting, and balancing. Refer to Division 1.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused openings in boxes.

3.10 CLEANING

A. Execution Requirements: Final cleaning. Refer to Division 1.

B. Clean interior of boxes to remove dust, debris, and other material.

C. Clean exposed surfaces and restore finish.

END OF SECTION – 260533

SECTION 260543

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Conduit, ducts, and duct accessories for direct-buried and concrete-encased duct banks, and in single duct runs.
2. Handholes and boxes.

1.3 DEFINITION

A. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Refer to Section 013300 – Submittal Procedures.

B. Product Data: For the following:

1. Duct-bank materials, including separators and miscellaneous components.
2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Accessories for manholes, handholes and boxes.
4. Warning tape.
5. Warning planks.

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

D. Source quality-control test reports.

E. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

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

1.7 COORDINATION

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

B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

PART 2 - PRODUCTS

2.1 CONDUIT

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

B. RNC: NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.2 NONMETALLIC DUCTS AND DUCT ACCESSORIES

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

1. ARNCO Corp.
2. Beck Manufacturing.
3. Cantex, Inc.
4. CertainTeed Corp.; Pipe & Plastics Group.
5. Condux International, Inc.

6. ElecSys, Inc.
7. Electri-Flex Company.
8. IPEX Inc.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT; a division of Cable Design Technologies.
11. Spiraduct/AFC Cable Systems, Inc.
12. Or approved equal

B. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Division 26 Section "Identification for Electrical Systems."

2.3 PRECAST CONCRETE HANDHOLES AND BOXES

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

1. Carder Concrete Products.
2. Christy Concrete Products.
3. Oldcastle Precast Group.
4. Riverton Concrete Products; a division of Cretex Companies, Inc.
5. Utility Concrete Products, LLC.
6. Utility Vault Co.
7. Wausau Tile, Inc.
8. Or approved equal

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

C. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.

1. Frame and Cover: Weatherproof steel frame, with hinged steel access door assembly with tamper-resistant, captive, cover-securing bolts.

   a. Cover Hinges: Concealed, with hold-open ratchet assembly.
   b. Cover Handle: Recessed.

2. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
3. Cover Legend: Molded lettering, "ELECTRIC." As indicated for each service.
4. Configuration: Units shall be designed for flush burial and have closed bottom, unless otherwise indicated.
5. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.

   a. Extension shall provide increased depth of 12 inches.

b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.

6. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

   a. Type and size shall match fittings to duct or conduit to be terminated.
   b. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.

7. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

PART 3 - EXECUTION

3.1 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-80-PVC, duct bank, unless otherwise indicated. Use RMC elbows.

B. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-80-PVC, in direct-buried duct bank, unless otherwise indicated.

C. Underground Ducts Crossing Driveways, Roadways and Railroads: RNC, NEMA Type EPC-80-PVC, encased in reinforced concrete.

3.2 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less, Including Telephone, Communications, and Data Wiring:

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

3.3 DUCT INSTALLATION

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

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

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

D. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches on centers for 5-inch ducts, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
2. Grout end bells into structure walls from both sides to provide watertight entrances.

E. Building Wall Penetrations: Make a transition from underground duct to concrete-encased rigid steel conduit at least 10 feet outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition.

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

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

H. Direct-Buried Duct Banks:

1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
2. Space separators close enough to prevent sagging and deforming of ducts, with not less than 5 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
3. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Division 31 Section "Earth Moving" for pipes less than 6 inches in nominal diameter.
4. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction.
5. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
6. Depth: Install top of duct bank at least 24 inches below finished grade, unless otherwise indicated.
7. Set elevation of bottom of duct bank below the frost line.
8. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

9. Warning Planks: Bury warning planks approximately 12 inches above direct-buried ducts and duct banks, placing them 24 inches o.c. Align planks along the width and along the centerline of duct bank. Provide an additional plank for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional planks 12 inches apart, horizontally.

3.4 INSTALLATION OF CONCRETE HANDHOLES, AND BOXES

A. Precast Concrete Handhole Installation:

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

B. Elevations:

1. Install handholes with bottom below the frost line, and no less than 36 inches below grade.
2. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
3. Where indicated, cast handhole cover frame integrally with handhole structure.

C. Waterproofing: Apply waterproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. After ducts have been connected and grouted, and before backfilling, waterproof joints and connections and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.

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

E. Field-Installed Bolting Anchors in Concrete Handholes: Do not drill deeper than 2 inches for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

3.5 GROUNDING

A. Ground underground ducts and utility structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."

3.6 FIELD QUALITY CONTROL

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

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

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

3.7 CLEANING

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

END OF SECTION – 260543

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Identification for conductors and communication and control cable.
2. Underground-line warning tape.
3. Warning labels and signs.
4. Instruction signs.
5. Equipment identification labels.
6. Miscellaneous identification products.

1.3 SUBMITTALS

A. Refer to Section 013300 – Submittal Procedures.

B. For all work specified in Division 26, submittals to include Type 1 (Manufacturer’s Name) and Type 2 (Product Data) information. In addition, submittals for the work listed below shall include the indicated type of information.

C. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145 (OSHA).

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation

and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

2.2 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, detectable continuous-printed, polyethylene tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend shall indicate type of underground line.

2.3 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.

C. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

3. High leg identification: “Caution: B Phase has 208 Volta to ground.”

2.4 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.5 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

B. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb, minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

A. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape and aluminum wraparound marker labels. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

B. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use aluminum wraparound marker labels. Identify each ungrounded conductor according to source and circuit number.

C. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.

D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply baked-enamel warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.
b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

G. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.

H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high.

b. Outdoor Equipment: Stenciled legend 4 inches high.
c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:

a. Panelboards, electrical cabinets, and enclosures.
b. Access doors and panels for concealed electrical items.
c. Motor-controllers.
d. Disconnect switches.
e. Motor starters.
f. Contactors.
g. Remote-controlled switches, dimmer modules, and control devices.
h. Monitoring and control equipment.
i. Receptacle cover plates – Refer to Section 262726.

3.2 INSTALLATION

A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Apply identification devices to surfaces that require finish after the finish work has been completed.

C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

D. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for service, feeder, and branch-circuit conductors.

1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
2. Colors for 240/120-V Circuits:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.
d. Neutral: White.

3. Per NEC 110.15 and 230.56 conductors with the higher phase voltage to ground shall be durably and permanently marked by an outer finish that is orange in color.
4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

E. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

G. Painted Identification: Prepare surface and apply paint according to Division 09 painting Sections.

END OF SECTION – 260553

SECTION 262416

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 SUBMITTALS

A. Refer to Section 013300 – Submittal Procedures.

B. For all work specified in Division 26, submittals to include Type 1 (Manufacturer’s Name) and Type 2 (Product Data) information. In addition, submittals for the work listed below shall include the indicated type of information.

C. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

D. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.

4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Details, features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
6. Include wiring diagrams for power, signal, and control wiring.
7. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

E. Qualification Data: For qualified testing agency.

F. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

G. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

H. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

I. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

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

E. Comply with NEMA PB 1.

F. Comply with NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.7 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
    b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Construction Manager's written permission.
3. Comply with NFPA 70E.

1.8 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.9 FINAL DEVICE SELECTION

A. Provide all overcurrent devices based on the final selections as required to achieve system coordination and the required fault current ratings.

B. The equipment submittal shall identify all device selections which have been altered to achieve conformance with the system requirements.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.11 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares for each panelboard.
3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

    a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    b. Outdoor Locations: NEMA 250, Type 3R.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover, "Door-in-Door": Entire front trim hinged to box and with standard door within hinged trim cover.
4. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
5. Finishes:

    a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    b. Back Boxes: Galvanized steel.
    c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

6. Directory Card: Inside panelboard door, mounted in transparent card holder or metal frame with transparent protective cover.

B. Incoming Mains Location: As suitable for the rough-in arrangement.

C. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Compression type.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Lighting and Appliance Branch Circuit Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. ABB
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or approved equal

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: As indicated.

E. Minimum integrated short circuit rating: 22,000 amperes rms symmetrical as indicated for 240 volt panelboards.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

G. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

H. Branch Overcurrent Protective Devices: Fused switches.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

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

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. ABB
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or approved equal

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: As indicated.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

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

1. ABB
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or approved equal

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with required interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
4. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
5. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
6. Combination Type Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration, with 5 amp trip protecting for both Series and Parallel arcs.
7. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
    f. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
    g. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
    h. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
    i. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.

j. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
k. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.5 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Equipment Mounting: Install panelboards on concrete bases, 4-inch nominal thickness.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to panelboards.
5. Attach panelboard to the vertical finished or structural surface behind the panelboard.

C. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

D. Box Top Mounting Height

1. Branch circuit panels up to 42 poles 76 inches AFF.
2. Branch circuit panels in excess of 42 poles 76” or as required to accommodate the device stack.
3. Distribution panels 76” or as required.
4. In no case shall the uppermost device operating handle exceed 79 inches AFF.

E. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

F. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

G. Install filler plates in unused spaces.

H. Stub four 1-inch empty conduits below slab not on grade for future use.

I. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing. Group multi-wire circuits individually.

J. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

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

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

C. Perform tests and inspections.

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

D. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

F. Panelboards will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION – 262416

SECTION 262726

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

1.4 SUBMITTALS

A. Refer to Section 013300 – Submittal Procedures.

B. For all work specified in Division 26, submittals to include Type 1 (Manufacturer’s Name) and Type 2 (Product Data) information. In addition, submittals for the work listed below shall include the indicated type of information.

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

D. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

E. Samples: One for each type of device and wall plate specified, in each color specified.

F. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

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

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Eaton
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).
5. Or approved equal

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, UL 498 and Fed. Spec. WC596.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Eaton; 5351 (single), 5352 (duplex).
b. Hubbell; HBL5351 (single), CR5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5381 (single), 5352 (duplex).
e. Or approved equal

B. Convenience receptacles installed in wet or damp locations shall be rated Weather Resistant as required by NEC-406.8 A and B.

2.3 GFCI RECEPTACLES

A. General Description: Straight blade type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; GF20.
    b. Pass & Seymour; 2084.
    c. Hubbell; GF20L
    d. Or approved equal

2.4 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Material for Unfinished Spaces: Galvanized steel
2. Material for Damp Locations: Cast aluminum with spring-loaded lift cover and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: Rain tight in-use rated die-cast aluminum with lockable cover.

2.5 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install device centerline at mounting heights above finished floor as follows:

1. Receptacle Outlet (General) 18 inches unless noted otherwise

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to install the device.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.

6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
10. Do not terminate stranded wires directly on wiring devices. Use pigtails or insulated fork terminals.

E. Receptacle Orientation:

1. Install receptacle with the strap aligned vertically.
2. Install ground pin of vertically mounted receptacles up

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Install GFCI receptacles as independently protected devices. Do not connect with feed-through protection to other receptacle outlets.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of in excess of 3 percent is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION – 262726

SECTION 262813

FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches, panelboards, switchboards, enclosed controllers and motor-control centers.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
4. Coordination charts and tables and related data.

B. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
4. Coordination charts and tables and related data.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from single manufacturer.

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

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Comply with UL 248-11 for plug fuses.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Cooper Bussmann, Inc.
2. Littelfuse, Inc.
3. Mersen USA
4. Or approved equal

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

B. Class RK1 fuses shall have an integral blown fuse indicator.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

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

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Main Service Switches up through 600 amperes: Class RK1 time delay.
2. Power Load Feeder Switches up through 600 amperes: Class RK1 time delay.
3. Motor Load Feeder Switches up through 600 amperes: Class RK1 time delay.
4. Lighting Load Feeder Switches up through 600 amperes: Class RK1 non-time-delay.
5. Other Feeder Switches up through 600 amperes: Class RK1 time delay.
6. General Purpose Branch Circuits up through 600 amperes: Class RK1 time delay.
7. Motor Branch Circuits up through 600 amperes: Class RK5 time delay.
8. Transformer Primary Circuits: Class RK5.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION – 262813

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Refer to Section 013300 – Submittal Procedures.

B. For all work specified in Division 26, submittals to include Type 1 (Manufacturer's Name) and Type 2 (Product Data) information. In addition, submittals for the work listed below shall include the indicated type of information.

C. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.

D. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

E. Field quality-control reports.

F. Operation and maintenance data.

1.5 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

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

1. ABB
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or approved equal

B. Type HD, Heavy Duty, Single Throw, 1200 A and Smaller, Voltage as Indicated: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Six Pole, Single Throw, 200 A and Smaller, Voltage as Indicated: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Double Throw, 1200 A and Smaller, Voltage as Indicated: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

E. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

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

1. Eaton Electrical Inc.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or approved equal

B. Type HD, Heavy Duty, Single Throw, 1200 A and Smaller, Voltage as Indicated: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Six Pole, Single Throw, 200 A and Smaller, Voltage as Indicated: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Double Throw, 1200 A and Smaller, Voltage as Indicated: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

E. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Suitable for number, size, and conductor material.

2.3 ENCLOSURES

A. Enclosed Switches: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.2 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION – 262816

SECTION 270500

COMMON WORK RESULTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 PROJECT DESCRIPTION

A. Provide and install a complete structured cabling system (SCS) for (FLOOD PARK, 215 BAY RD, MENLO PARK, CA, 94025). The cabling system shall include, but not be limited to horizontal TO SUPPORT WIRELESS ACCESS POINTS , termination and labeling components.

B. The principal bid for this project shall be based on a structured cabling system manufactured by:

1. Belden
2. Commscope (systimax)
3. Commscope (uniprise)
4. Corning (fiber)
5. Hubbell
6. Leviton / Berk-Tek technologies
7. Ortronics and superior essex (ncompass)
8. Panduit
9. Panduit and general cable (pan-gen)

1.3 REFERENCED STANDARDS AND CODES

A. NFPA 70 National Electric Code (NEC).

B. Authority having jurisdiction.

C. Local and State Building Codes.

D. UL® for wiring: UL® Standard 910 “Test method for fire and smoke characteristics of cable used in air handling spaces.” Provide products that are UL® listed and labeled for such use. UL® testing bulletin. Underwriters Laboratories (UL®) cable certification and follow up program.

E. American National Standards Institute/Telecommunications Industry Association.

1. ANSI/TIA-222-g – structural standards for steel antenna towers and antenna supporting structures.
2. ANSI/TIA-526– measurement of optical power loss of installed single-mode fiber cable plant – ofstp-7.
3. ANSI/TIA-526– optical power loss measurements of installed multimode fiber cable plant – ofstp-14.
4. ANSI/TIA-568– commercial building telecommunications cabling standard.
5. TIA-569 telecommunications pathways and spaces.
6. TIA-590 – standard for physical location and protection of below-ground fiber optic cable plant.
7. ANSI/TIA-598 – optical fiber cable color coding.
8. ANSI/TIA-606 – administration standard for telecommunications infrastructure.
9. ANSI/TIA-607 – generic telecommunications bonding and grounding (earthing) for customer premises.
10. ANSI/TIA-758 - customer-owned outside plant telecommunications infrastructure standard.
11. for maintaining optical fiber polarity through reverse-pair positioning.
12. TIA TSB-140 - additional guidelines for field test length, loss and polarity of optical fibers.
13. TIA TSB-162 - telecommunications cabling guidelines for wireless access points.
14. TIA TSB-190 – guidelines on shared pathways and shared sheaths

F. ANSI/NECA/BICSI 568-2006 – standard for installing commercial building telecommunications cabling.

G. 8NECA/BICSI 607-2011 – standard for telecommunications bonding and grounding planning and installation methods for commercial buildings

H. National electrical manufacturers association (NEMA).

I. American Society for Testing Materials (ASTM).

J. Institute of Electrical and Electronic Engineers (IEEE).

1.4 RELATED SECTIONS

A. 260526 Grounding and Bonding for Electrical Systems

B. 260529 Hangers and Supports for Electrical Systems

C. 260533 Raceways and Boxes for Electrical Systems

D. 260536 Cable Trays for Electrical Systems

E. 260539 Underfloor Raceways for Electrical Systems

F. 270526 Grounding and Bonding for Communications Systems

G. 270528 Pathways for Communications Systems

H. 270529 Hangers and Supports for Communications Systems

I.	270536	Cable Trays for Communications Systems
J.	270543	Underground Pathways and Structures for Communication Systems
K.	270544	Sleeves and Sleeve Seals for Communications Pathways and Cabling
L.	270553	Identification for Communications Systems
M.	271100	Communications Equipment Room Fittings
N.	271116	Communications Racks, Frames, and Enclosures
O.	271313	Communications Copper Backbone Cabling
P.	271323	Communications Optical Fiber Backbone Cabling
Q.	271333	Communications Coaxial Backbone Cabling
R.	271513	Communications Copper Horizontal Cabling
S.	271523	Communications Optical Fiber Horizontal Cabling
T.	271533	Communications Coaxial Horizontal Cabling
U.	274133	Master Antenna Television System

1.5 DEFINITIONS / ACRONYMS / ABBREVIATIONS

AHJ	Authority Having Jurisdiction
ANSI	American National Standards Institute
AWG	American Wire Gauge
CAT 3	Category 3 performance as defined by ANSI/TIA-568
CAT 5E	Category 5e performance as defined by ANSI/TIA-568
CAT 6	Category 6 performance as defined by ANSI/TIA-568
CAT 6A	Augmented Category 6 performance as defined by ANSI/TIA-568
DC	Data Center
EC	Electrical Contractor
ER	Equipment Room
EOR	Engineer of Record
GC	General Contractor
IEC	International Electrotechnical Commission
IDF	Intermediate Distribution Room (see also ER or TR)
MDF	Main Distribution Room (see also MER, TR or Server Room)
ISO	International Organization for Standardization
MM	Multimode (Fiber Optic Cable)
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
OM3	Optical Multimode 3 “laser optimized” performance as defined by ISO/IEC 11801 and ANSI/TIA-568

OM4	Optical Multimode 4 “laser optimized” performance as defined by ISO/IEC 11801-Amd2 and ANSI/TIA-568
OS1	Optical Singlemode 1 performance as defined by ISO/IEC 11801 and ANSI/TIA-568
OS2	Optical Singlemode 2 “low water peak” performance as defined by ISO/IEC 11801-Amd2 and ANSI/TIA-568
PBB	Primary Bonding Busbar
PDU	Power Distribution Unit
RBB	Rack Bonding Busbar
RMU	Rack mount Unit (see also RU)
RU	Rack unit
SBB	Secondary Bonding Busbar
SC	Security Contractor
SCS	Structured Cabling System
SM	Single Mode Fiber
STP	Shielded Twisted Pair Cable
UTP	Unshielded Twisted Pair Cable
TBB	Telecommunications Bonding Backbone
TBBIBC	Telecommunications Bonding Backbone Interconnection Bonding Conductor
TBC	Telecommunications Bonding Conductor
TC	Telecommunications Contractor
TIA	Telecommunications Industry Association
TGB	Telecommunications Ground Bus Bar
TMGB	Telecommunications Main Ground Bus Bar
TO	Telecommunications Outlet
TR	Telecommunication Room
UNO	Unless Noted Otherwise
UTP	Unshielded Twisted Pair Cable

1.6 SUBMITTALS

A. Cut Sheet Submittals: Contractor shall provide manufacturer product data submittals, with the intended part number(s) and use clearly indicated, for the following:

1. All cable and wire including premises cables, patch cables and cross connect wire.
2. All connectors and required tools.
3. All termination system components for each cable type.
4. All communications grounding system components TO GROUND CONDUITS.
5. All test equipment to be used for copper and optical fiber certification, including current certificates of calibration.

B. Shop Drawing Submittals: Contractor shall submit shop drawings clearly indicating the following, but not limited to:

1. Exact conduit, pull box and raceway layouts.
2. Wireless access point outlet labeling plan.
3. Contractor shall coordinate with appropriate trade contractors and EOR.

C. Samples and Mock-ups: Contractor shall submit sample product mock ups for review by owner and EOR. Digital photos are encouraged. Samples shall include but not be limited to:

1. Faceplates: Provide a sample of each type of faceplate used on the project. Sample shall include jack inserts and sample label (text, font and size).
2. Cable: Provide a 3ft long sample of each cable being installed with a sample label (text, font and size)
3. Patch Panels: Provide a sample of planned patch panel labeling (text, font and size)

D. Patch Cord Submittal: Contractor shall submit a matrix of quantity, length and color of patch cords for owner approval.

E. Close out Submittals:

1. Contractor shall provide electronic formatted as-built drawings to owner and engineer of record (EOR) in an electronic format as determined by owner upon completion of project.
2. The contractor shall provide a One (1) year general construction warranty.
3. The contractor shall supply an extended life (20+ years) manufacturer warranty for the installed structured cabling system. The manufacturer warranty must ensure that the structured cabling system (SCS) will be free from product defects in material and workmanship, will exceed applicable TIA/EIA and ISO/EIC specifications in force at the time of installation and will comply with design and performance requirements for recognized cabling media installed in the structured cabling link/channel. All cable shall support all current or future applications that are designed for transmission over its respective cabling classification as defined in ANSI/TIA-568.
4. The contractor shall mount a laminated 1/2-sized as-built drawing next to the IT Rack. The contractor shall submit a photo or owner sign-off of the as-built drawing for project close-out.
5. The contractor shall provide a written sign-off verification that the specified owner training/orientation was completed.
6. The contactor shall provide a written sign-off verification of the completion of the patch cable installation and hand-over of patch cables specified for owner installation.

F. Test Equipment

1. TC shall submit manufacturer data sheets for all test equipment to be utilized in the certification of the structured cabling system.
2. The TC shall submit current calibration certificates to EOR for all equipment to be utilized in the testing of the structured cabling system. All calibration certificates are to be issued by the test equipment manufacturer. Certificates are to be received by EOR no less than seven days prior to beginning any testing.

G. Test Data.

1. The contractor shall provide test data as specified for each sub-system.

1.7 CONTRACTOR QUALIFICATIONS

A. The contractor selected for this project shall be certified by the SCS manufacturer, adhere to the design engineering, installation and certification procedures and utilize the authorized manufacturer components in completing this project.

B. The contractor shall:

1. Have a BICSI certified RCDD on staff and readily available for this project. A copy of the BICSI certificate or stamp shall be provided. Lead installer shall have a minimum of 5-years of installation work experience running projects.
2. Be experienced in all aspects of the work required to complete this project and shall be required to demonstrate direct experience on recently installed systems of similar size and type.
3. Carefully examine the contract documents and make arrangements to visit the site, and thoroughly become familiar with the building standards and local conditions relating to the work. Failure to do so will not relieve the contractor of the obligations of the contract.
4. Own and maintain equipment and tools required for the installation and testing of the specified structured cabling systems. The contractor shall also employ personnel who are adequately trained in the uses of required tools and equipment.

C. These documents detail the components and installation guidelines that need to be included for the project. These documents contain work that is the responsibility of multiple contractors i.e. communication contractor, electrical contractor, general contractor etc. It is not the intent of these documents to dictate which contractor is responsible for each task; the Prime contractor/construction manager shall delegate the work to the appropriate sub-contractors.

1.8 SCOPE OF WORK

A. Telecommunications Scope of Work.

1. The Contractor shall carefully examine the contract documents and make a scheduled arrangement with the landlord to visit the site, and thoroughly become familiar with the building standards and local conditions relating to the work. Failure to do so will not relieve the contractor of the obligations of the contract.
2. Provide UL® listed fireseal systems for all telecommunications cabling pathways using caulk putty, pillows or similar devices per manufacturer's instructions to maintain existing and new fire ratings. Verify rating conditions and locations prior to final bids. All open sleeves, slots or other penetrations shall be fire sealed inside after all cabling is completely installed. Fireseal methods shall be submitted by contractor and shall be subject to the approval of the owner. Contractor shall provide caps and fireseal to maintain the original cores that are not to be used and/or reused. Contractor shall verify exact quantities in the field prior to submission of bids.
3. Provide all wireless access points cabling, termination hardware, and accessories as specified for a complete and operational facility.
4. Properly ground telecommunications conduits in accordance with manufacturer recommendations and ANSI/TIA-607, NFPA 70, all applicable building codes and specification section 27 05 26.
5. Label all telecommunications cables, faceplates, patch panels and termination hardware with permanent machine typed labels in accordance with ANSI/TIA-606 standard, telecommunications drawings and specifications.
6. Completely test the telecommunications system(s) in accordance with applicable standards as referenced in the telecommunication systems specifications.
7. Provide electronic formatted as-built drawings to owner upon completion of project.
8. Assist access providers with coordination of related work.

1.9 UNIT PRICES

A. The telecommunications contractor shall provide unit prices with proposal as indicated below. A sample of telecommunications technology unit pricing for added or deleted work is listed below. All unit costs shall include labor, material, coordination, supervision, project management, overhead, profit, miscellaneous support hardware, taxes, fees, shipping and handling. Telecommunications contractor shall edit as required and indicate unit of measurement.

B. Work area outlet unit costs are to include faceplate, outlets, cables, miscellaneous hardware and labor to pull, terminate (both ends) and test each typical location per telecommunications specifications. Identify number of cables and outlets at each typical location including category for each cable.

1. OM3 hybrid Fiber cable for wireless access point
2. 10 Ft. OM3 hybrid Fiber patch cable

C. Equipment room and telecommunications room unit costs shall include all labor and material. Termination of cables on the hardware is listed separately.

1. 1RU FIBER ENCLOSURE
2. Fiber module
3. 10 Ft. OM3 hybrid Fiber patch cable
4. D-rings

END OF SECTION – 270500

SECTION 270526

GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes the requirements for a uniform telecommunications bonding and grounding infrastructure system including grounding electrodes and conductors; equipment grounding conductors; bonding methods and materials; grounding of telecommunications systems and equipment, and requirements for grounding for protection of life, equipment, circuits and systems. Grounding requirements specified in this section may be supplemented in other sections of these specifications.

B. Section Includes:

1. Grounding conductors.
2. Grounding connectors.
3. Grounding labeling.

1.3 DEFINITIONS

Backbone:	A facility (e.g., pathway, cable, conductors, optical fibers) between any of the following spaces: telecommunications rooms (TRs), telecommunications enclosures (TEs), common TRs, floor-serving terminals, entrance facilities (EFs), equipment rooms (ERs), and common ERs.
Backbone Bonding Conductor (BBC)	A telecommunications bonding connection which interconnects telecommunications bonding backbones.
Bonding:	The effective joining of metallic parts to form an electrically conductive path that will ensure electrical continuity and the capacity to safely conduct any current likely to be imposed.
Bonding Conductor for Telecommunications (BCT):	A regional term for telecommunications bonding conductor (TBC).
Commercial Building:	A building or portion thereof that is intended for office use.

Common Bonding Network (CBN):	The principal means for effecting telecommunications bonding and grounding (earthing) inside a building. It is the set of metallic components that are intentionally or incidentally interconnected to form the principal bonding network (BN) in a building. These components include structural steel or reinforcing rods, plumbing, alternating current (ac) power conduit, ac equipment ground (ACEG) conductors, cable trays, racks and cabinets, and bonding conductors. The CBN always has a mesh topology and is connected to the grounding electrode system.
Conduit:	1. A raceway of circular cross section. 2. A structure containing one or more ducts. (TIA)
Conduit Run:	Multiple sections of conduit that are joined together with fittings.
Conduit System	Any combination of ducts, conduits, junction boxes, maintenance holes, handholes, and vaults joined to form an integrated whole.
Connecting Hardware:	A device or combination of devices used to connect optical fiber cables or cable elements.
Effective Ground:	Intentional connection to earth through a ground connection or connections of sufficiently low impedance (whose value is specified in suitable bonding and grounding [earthing] standards) and having sufficient current-carrying capacity to prevent the build-up of voltages that may result in undue hazards to connected equipment or to persons. (NEC®)
Entrance Facility (EF):	An entrance to a building for both public and private network service cables, including wireless, mechanical and electrical services, and the entrance point at the building wall, and continuing to the entrance room or space. See also building entrance, demarcation point (demarc) and entrance room or space.
Entrance Point (EP):	The point of emergence for telecommunications cabling through an exterior wall, a floor, or from a conduit. (TIA)
Entrance Room or Space:	A space in which the joining of inter or intrabuilding backbone facilities takes place. (TIA) See also entrance facility (EF).
Equipment Room (ER):	An environmentally controlled centralized space for telecommunications equipment that usually houses a main or intermediate cross-connect. (TIA)
Equipotential Bonding:	Properly designed and installed electrical connections putting various exposed conductive parts and extraneous conductive parts at a substantially equal potential, especially during normal non-transient conditions.
Exothermic Weld:	A method of permanently bonding two metals together by a controlled heat reaction, resulting in a molecular bond. (TIA)

Ground:	A conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of earth. (TIA) See also approved ground and earth ground.
Grounding Electrode:	1. A conductor, (usually a rod, pipe, plate, or group of conductors), in direct contact with the earth for the purpose of providing a low-impedance connection to the earth. (TIA) 2. A device that establishes an electrical connection to the earth. (NEC)
Grounding Electrode Conductor:	The conductor used to connect the grounding electrode to either the equipment grounding conductor, or to the grounded conductor of the circuit at the service equipment, or at the source of a separately derived system. (TIA)
Grounding Electrode System:	One or more grounding electrodes bonded to form a single reliable ground for a structure.
Grounding Equalizer (GE):	A regional term for backbone bonding conductor (BBC).
Listed:	One of four product test ratings used in the United States (Listed, Classified, Recognized, Verified). A product is Listed after it successfully completes a series of mechanical, electrical, and thermal characteristics tests that simulate all reasonable, foreseeable hazards. The Listed classification is exclusive to the product for the specific applications for which it was tested and is not valid for other applications.
Mesh Bonding Network (mesh-BN):	A non-isolated bonding network to which all associated cabinets, frames, racks, trays, and pathways are connected by using a bonding grid. This grid is connected by multiple points to the common bonding network (CBN).
Pathway:	1. Physical infrastructure (e.g., conduit, cable tray, raceway) used to facilitate the placement of information and communications technology (ICT) or electronic safety and security (ESS) cabling media. 2. A term used within the United States to denote any method of connecting elements of the fire alarm system (e.g., electrical, optical, radio frequency [RF]).
Primary Bonding Busbar (PBB)	A busbar placed in a convenient and accessible location and bonded, by means of the telecommunications bonding conductor (TBC), to the building's service equipment (power) ground.
Protector:	A device that prevents damage to lines or equipment by conducting hazardous high voltages or currents to ground. Most protectors come in assemblies containing fusible link stubs and the housing and circuitry for individual protector units.
Protector Unit:	A replaceable voltage-shunting device that is inserted on each cable pair in a protector assembly. The units come in a variety of types based on clamping voltages and reaction time.

Secondary Bonding Busbar (SBB)	A common point of connection for telecommunications system and equipment bonding to ground and located in the distributor room.
Sleeve:	A short length of raceway, usually conduit, for protecting cable passing through a single wall, ceiling, or floor.
Telecommunications:	Any transmission, emission, and reception of signs, signals, writings, images, and sounds; that is, information of any nature by using copper cable, radio, optical, or other electromagnetic systems. (TIA)
Telecommunications Bonding Backbone (TBB):	A conductor that interconnects the primary bonding busbar (PBB) to the secondary bonding busbar (SBB). (TIA)
Telecommunications Bonding Conductor (TBC):	A conductor that interconnects the telecommunications bonding infrastructure to the building's service equipment (power) ground.
Telecommunications Equipment Bonding Conductor (TEBC):	A bonding conductor that should be installed from each piece of equipment in the telecommunications room (TR) or equipment room (ER) to the secondary bonding busbar (SBB) or primary bonding busbar (PBB). TEBCs may also be connected to the rack grounding busbar (RGB), if the rack or cabinet has one.
Telecommunications Room (TR):	A telecommunications space that differs from equipment rooms (ERs) and entrance facilities (EFs) in that this space is generally considered a floor-serving or tenant-serving (as opposed to building- or campus-serving) space that provides a connection point between backbone and horizontal cabling.
AC	Alternating Current
ACEG	Alternating Current Equipment Ground
AHJ	Authority Having Jurisdiction
AWG	American Wire Gauge
BBC	Backbone Bonding Conductor
BN	Bonding Network
BICSI	Building Industry Consulting Services International
CBC	Coupled Bonding Conductor
CBN	Common Bonding Network
DC	Direct Current
EF	Entrance Facility
EIA	Electronics Industries Alliance
EMT	Electrical Metallic Tubing
EOR	Engineer of Record
ESD	Electrostatic Discharge
IBN	Isolated Bonding Network
MTW	Machine Tool Wire
NRTL	National Recognized Testing Laboratory
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code

NFPA	National Fire Protection Association
NRTL	Nationally Recognized Testing Laboratory
PBB	Primary Bonding Busbar
PBG	Principal Building Ground
RBB	Rack Bonding Busbar
SBB	Secondary Bonding Busbar
SBTC	Solid Bare Tinned Copper
ScTP	Screened Twisted Pair
STP	Shielded Twisted Pair
TBB	Telecommunications Bonding Backbone
TBC	Telecommunications Bonding Conductor
TEBC	Telecommunications Equipment Bonding Conductor
TEF	Telecommunications Entrance Facility
TER	Telecommunications Entrance Room
TIA	Telecommunications Industry Association
UTP	Unshielded Twisted Pair

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For communications equipment room signal reference grid. Include plans, elevations, sections, details, and attachments to other work.

1.5 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing as-built locations of grounding and bonding infrastructure, including the following:

1. Routing of the bonding conductors to bond conduits.

B. Qualification Data: For installer, installation supervisor, and field inspector.

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

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

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

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Result of the ground-resistance test, measured at the point of TBC connection.
b. Field quality-control test results.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of ITS Technician, who shall be present at all times when Work of this Section is performed at Project site.
2. Field Inspector: Currently registered by BICSI as Technician to perform the on-site inspection.

B. Testing Agency Qualifications: A Nationally Recognized Testing Laboratory@ (NRTL) as defined in OSHA Regulation 1910, or a full member company of the National Electrical Testing Association (NETA).

1. Testing Agency Field Supervision: Use persons currently certified by NETA or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

C. Comply with NFPA 70.

D. Comply with UL 467.

E. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms Listed and Labeled As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A Nationally Recognized Testing Laboratory (NRTL) as defined in OSHA Regulations 1910.7.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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

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

C. Comply with TIA-607.

2.2 CONDUCTORS

A. Comply with UL 486A-486B.

B. All bonding and grounding conductors shall be copper and may be insulated. All insulated conductors shall be listed for the application. The minimum bonding conductor size shall be No. 6 AWG MTW.

C. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

D. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

E. Signal Reference Grid Connectors: Combination of compression wire connectors, access floor grounding clamps, bronze U-bolt grounding clamps, and copper split-bolt connectors, designed for the purpose.

F. Busbar Connectors: Cast silicon bronze, solderless compression or exothermic-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar.

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

2.3 IDENTIFICATION

A. Comply with requirements for identification products in Section 270553 "Identification for Communications Systems."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with TIA-607.

B. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.

C. Conductor Support:

1. Secure grounding and bonding conductors at intervals of not less than 36 inches.

D. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch intervals.

4. Install grounding and bonding conductors in 3/4-inch PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

    a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a SBB.

3.2 CONNECTIONS

A. Bond metallic equipment in a telecommunications space to the grounding busbar in that room, using equipment grounding conductors not smaller than 6 AWG.

B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pre-twist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

D. Shielded Cable: Bond the shield of shielded cable to the SBB in communications space. Comply with TIA-568 when grounding shielded balanced twisted-pair cables.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

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

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect grounding conductors to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.4 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.

1. Label the TBC at its attachment point: "WARNING! IF THIS CONNECTOR OR CABLE IS LOOSE OR MUST BE REMOVED PLEASE CALL THE BUILDING TELECOMMUNICATIONS MANAGER!"

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in telecommunications space containing a PBB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.
3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.

    a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the PBB. Maximum acceptable ac current level is 1 A.

C. Excessive Ground Resistance: If resistance to ground at the TBC exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.

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

E. Prepare test and inspection reports.

END OF SECTION – 270526

SECTION 270543

UNDERGROUND PATHWAYS AND STRUCTURES FOR COMMUNICATION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal conduit and fittings, including GRC and PVC-coated GRC.
2. Polymer concrete handholes and boxes with polymer concrete cover.

1.3 DEFINITIONS

A. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include conduits and their accessories, including elbows, end bells, bends, fittings.
2. Include accessories for manholes, handholes.
3. Include underground-line warning tape.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:

a. Include plans, elevations, sections, details, attachments to other work, and accessories.
b. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
b. Include duct entry provisions, including location and duct size.
c. Include cover design.
d. Include grounding details.

e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.

B. Source quality-control reports.

1.6 FIELD CONDITIONS

A. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

B. Ground Water: Assume ground-water level is 36 inches below ground surface unless a higher water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. GRC: Comply with ANSI C80.1 and UL 6.

B. PVC-Coated Steel Conduit: PVC-coated GRC IMC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

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

1. Allied Tube & Conduit; a part of Atkore International
2. Calconduit
3. Electri-Flex Company
4. FSR Inc
5. Plasti-Bond
6. Engineer approved equal

D. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
2. Comply with TIA-569-C and TIA-758-C.

2.2 POLYMER CONCRETE HANDHOLES AND BOXES WITH POLYMER CONCRETE COVER

A. Description: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

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

1. Armorcast Products Company
2. Oldcastle Enclosure Solutions
3. Quazite: Hubbell Power Systems, Inc
4. Engineer approved equal

C. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

D. Color: Gray or Green.

2.3 SOURCE QUALITY CONTROL

A. Tests of materials shall be performed by an independent testing agency.

B. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.

C. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of hand holes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations conduit entrances into handholes, and boxes with final locations and profiles of conduits, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

C. Clear and grub vegetation to be removed, and protect vegetation to remain according to Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication according to Section 311000 "Site Clearing."

3.2 EARTHWORK

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

B. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated.

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

D. Cut and patch existing pavement in the path of underground duct, duct bank, and utility structures according to the "Cutting and Patching" Article in Section 017300 "Execution."

3.3 THAN PRECAST CONCRETE

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

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

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

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

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

F. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring, encircling, and in contact with, enclosure, and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.

1. Concrete: 3000 psi, 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.
2. Dimensions: 12 inches wide by 12 inches deep

3.4 GROUNDING

A. Ground underground utility structures according to Section 270526 "Grounding and Bonding for Communications Systems."

3.5 FIELD QUALITY CONTROL

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

1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
2. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 270526 "Grounding and Bonding for Communications Systems."

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

3.6 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris.

B. Clean internal surfaces of manholes, including sump.

1. Sweep floor, removing dirt and debris.
2. Remove foreign material.

END OF SECTION – 270543

SECTION 270554

IDENTIFICATION FOR OUTSIDE PLANT COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Color and legend requirements for labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes.
5. Signs.
6. Cable ties.
7. Fasteners for labels and signs.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for communications identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule:

1. Outlets: Scaled drawings indicating location and proposed designation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70 and TIA 606.

B. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

C. Operational Temperature Threshold: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Equipment Identification Labels:

1. Black letters on a white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

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

a. Brady Corporation.
b. Champion America.
c. Grafoplast Wire Markers.
d. HellermannTyton.
e. Marking Services, Inc.
f. Panduit Corp.

B. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- thick, polyester vinyl flexible labels with acrylic pressure-sensitive adhesive.

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

a. Brady Corporation.
b. Brother International Corporation.
c. Ideal Industries, Inc.
d. Panduit Corp.
e. Or Engineer Approved Equal

2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating protective shields over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
3. Marker for Labels: Machine-printed, permanent, waterproof black ink recommended by printer manufacturer.

C. Self-Adhesive Labels: Polyester Vinyl, thermal, transfer-printed, 3-mil- thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

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

a. 3M
b. Brady Corporation.
c. Brother International Corporation.
d. Ideal Industries, Inc.

e. Panduit Corp.
f. Or Engineer Approved Equal

2. Minimum Nominal Size:

a. 1-1/2 by 6 inches for raceway and conductors
b. 3-1/2 by 5 inches for equipment.
c. As required by authorities having jurisdiction.

2.4 UNDERGROUND-LINE WARNING TAPE

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

1. 3M
2. Brady Corporation.
3. Ideal Industries, Inc.
4. Or Engineer Approved Equal

B. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

C. Color and Printing:

1. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, and ANSI Z535.4.
2. Inscriptions for Orange-Colored Tapes: "OPTICAL-FIBER CABLE"

D. Tag: Type I

1. Pigmented polyolefin, bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Width: 3 inches.
3. Thickness: 4 mils.
4. Weight: 18.5 lb/1000 sq. ft..
5. Tensile according to ASTM D 882: 30 lbf and 2500 psi.

2.5 SIGNS

A. Baked-Enamel Signs:

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

a. Carlton Industries, LP.
b. Champion America.

c. Marking Services, Inc.

2. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
3. 1/4-inch grommets in corners for mounting.
4. Nominal Size: 7 by 10 inches.

B. Metal-Backed Butyrate Signs:

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

a. Brady Corporation.
b. Champion America.
c. Marking Services, Inc.

2. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.

3. 1/4-inch grommets in corners for mounting.
4. Nominal Size: 10 by 14 inches.

C. Laminated-Acrylic or Melamine-Plastic Signs:

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

a. Brady Corporation.
b. Carlton Industries, LP.
c. Marking Services, Inc.

2. Engraved legend.
3. Thickness:

a. For signs up to 20 sq. in., minimum 1/16 inch thick.
b. For signs larger than 20 sq. in., 1/8 inch thick.
c. Engraved legend with black letters on white face.
d. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.

G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

H. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
3. Provide label 6 inches from cable end.

I. Self-Adhesive Wraparound Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6 inches from cable end.

J. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.

K. Underground-Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 12 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench 16 inches overall.
2. Install underground-line warning tape for direct-buried cables and cables in raceways.

L. Cable Ties: General purpose, except as listed below:

1. Outdoors: UV-stabilized nylon.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.

1. System legends shall be as follows:

a. Telecommunications.

C. Equipment Housings and Equipment Enclosure Labeling:

1. Patch Panels: Label individual rows and outlets, starting at to left and working down, with self-adhesive labels.

a. Area designation number being served.
b. Dash.
c. WAP number.

D. Locations of Underground Lines: Underground-line warning tape for hybrid copper/fiber.

E. Instructional Signs: Self-adhesive labels.

F. Warning Labels for Cabinets, Boxes, and Enclosures: Baked-enamel warning signs or Metal-backed, butyrate warning signs.

1. Apply to exterior of door, cover, or other access.

G. Equipment Identification Labels:

1. Outdoor Equipment: Laminated-acrylic or melamine-plastic sign.
2. Equipment to Be Labeled:

a. Wireless Access Point

END OF SECTION – 270553

SECTION 271523

COMMUNICATIONS OPTICAL FIBER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. 850 nanometer laser-optimized 50/125 micrometer multimode optical fiber cable (OM3)
2. Optical fiber cable connecting hardware, patch panels, and cross-connects.
3. Grounding.
4. Cabling identification products.

1.2 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. RCDD: Registered Communications Distribution Designer.

1.3 OPTICAL FIBER HORIZONTAL CABLING DESCRIPTION

A. Optical fiber horizontal cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C and the equipment outlet, otherwise known as "Cabling Subsystem 1" in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.

1. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the equipment outlet.
2. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the equipment outlets to the equipment.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Reviewed and stamped by RCDD.

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration Drawings and printouts.
4. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment, including the following:

    a. Telecommunications pathways.
    b. Telecommunications system access points.
    c. Telecommunications grounding system.
    d. Typical telecommunications details.

C. Fiber optic cable testing plan.

D. Sustainable Design Submittals:

1. Samples: For telecommunications jacks and plugs, in specified finish, one for each type and configuration.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For RCDD and/or Installer, installation supervisor, and field inspector.

B. Product Certificates: For each type of product.

C. Source quality-control reports.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On USB media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

B. Maintenance Data: For optical fiber cable, splices, and connectors to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Jacks: five of each type.
2. Plugs: five of each type.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.

1.9 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569.

C. Grounding: Comply with TIA-607.

2.2 850 NANOMETER LASER-OPTIMIZED, 50/125 MICROMETER, MULTIMODE OPTICAL FIBER CABLE (OM4)

A. Description: Multimode, 50/125-micrometer, factory-fabricated, low-loss, glass-type multimode graded index cables 4 fiber, conductive loose tube, optical fiber cable, with the following operational and construction features:

1. Orange color-coded cable jacket.
2. Supports 1 Gbps Ethernet applications to 300 meters.
3. UL listed type OFNR, CSA certified, CSA certified, CSA FT6.
4. Legacy support: Ethernet, Fast Ethernet, Token Ring, ATM, FDDI.
5. Dual coating for excellent environmental performance and long-term reliability.
6. Compliant with IEC 60793 and EIA/TIA 492 specifications.

B. Standards:

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA-568 for performance specifications.
3. Comply with TIA-492AAAD for detailed specifications.

C. Jacket:

1. Jacket Color: Orange
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598.

3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

D. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

1. Riser Rated, Conductive: Type OFCP, Type OFNP, Type OFCR, or Type OFNR in metallic conduit.

E. Multimode fiber optic cables shall meet the following physical specifications:

Core Diameter:	50 µm +/-3 µm
Core/Cladding Concentricity Error:	<= 1.5 µm
Cladding Non-Circularity:	< 2.0%
Coating Diameter (uncolored):	245 +/- 10 µm
Proof Test Levels:	0.7 Gpa minimum
Operating Temperature Range:	-60º C to 85º C
Core Non-Circularity:	<= 5%
Cladding Diameter:	125 µm +/- 2µm
Colored Fiber Diameter:	250 +/- 15 µm
Coating/Cladding Concentricity Error:	+/- 8 µm
Minimum Tensile Strength:	100,000 psi

F. Multimode fiber optic cables shall meet or exceed the following optical specifications:

Maximum Attenuation:	2.4 dB/km at 850 nm 0.7 dB/km at 1300 nm
Minimum Bandwidth:	500 MHz-km at 850 nm (overfilled) 500 MHz-km at 1310 nm (overfilled) 4700 MHz-km at 850 nm (laser) 500 MHz-km at 1300 nm (laser)
Numerical Aperture:	0.200 + 0.015
Nominal Refraction Index Difference bw Peak of Core and Cladding:	1.0%
Effective Group Index of Refraction @ 850 nm:	1.483
Effective Group Index of Refraction @ 1300 nm:	1.479
Point Discontinuities @ 850 nm and 1300 nm:	<=0.2 dB

2.3 OPTICAL FIBER CABLE HARDWARE

A. Standards:

1. Comply with Fiber Optic Connector Intermateability Standard (FOCIS) specifications of the TIA-604 series.
2. Comply with TIA-568.

B. Fiber patch panels shall be:

1. Mount in standard 19” rack (TIA rails)
2. Front loading panels
3. Comply with ANSI/TIA-606 labeling standards
4. Support a minimum density such that a 1 RMU shelf must accept a minimum of 48 LC connectors or 24 SC connectors.
5. Fiber Panel Configurations:

a. RMU: 1 Fiber Type: MM , Connector type: LC, Quantity: 12

C. Patch Cords: Factory-made patch cords per schedule on drawings

1. Multimode

a. All multimode connector shall be LC, and have the following features:

1) Pre-connectorized pigtail for fusion splice connection. Mechanical splice connections are not permitted.

a LC

Insertion loss 0.2 dB typical

Reflection < -40 dB

Material:

Ferrule: phosphor bronze zirconia

Housing: thermoplastic

Color: Aqua

D. Jacks and Jack Assemblies:

1. Female; quick-connect, simplex and duplex; fixed telecommunications connector.
2. Insertion loss not more than 0.75dB.
3. Marked to indicate transmission performance.
4. Designed to snap-in to a patch panel or faceplate.

2.4 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607.

2.5 IDENTIFICATION PRODUCTS

A. Comply with TIA-606 and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569, Annex A, "Firestopping."

C. Comply with BICSI ITSIMM, "Firestopping" Chapter.

3.3 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

B. able and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Label each unit within distribution racks and frames.

C. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606, for the following:

1. Flexible vinyl or polyester that flexes as cables are bent.

3.4 OPTICAL CABLE CERTIFICATION

A. Notification: The contractor shall notify the client and EOR in writing a minimum of 72 hours prior to the start of certification and provide a complete testing schedule to allow for witnessing of certification.

B. Requirement: Complete end to end certification results shall be submitted to the client and EOR in electronic format. No hand-written test results will be accepted. If special software or license is required to review certification data electronically, contractor shall provide one copy of software and appropriate license with each set of certification data.

C. Remove and replace cabling where test results indicate that it does not comply with specified requirements.

D. Certification Equipment:

1. The contractor shall submit calibration certificate(s) indicating that the test set(s) has been calibrated by the manufacturer. No certification shall be performed with a test set that has not been calibrated within 6 months prior to certification.

2. Acceptable test sets:

a. Alcoa Fujikura
b. Corning cable systems
c. Fluke
d. Noyes
e. Tektronix
f. Engineer approved equal

E. Pre-installation cable testing:

1. The contractor shall test all optical cable prior to the installation of the cable. The contractor shall assume all liability for the replacement of the cable should it be found defective at a later date.
2. Loss budget: contractor shall provide calculations indicating the maximum loss budget for each fiber using the following formula:
3. (allowable cable loss per km) x (km of fiber in link) + (mfr published connector loss) x (number of connectors) = maximum allowable loss
4. The contractor shall provide loss budgets to EOR for review prior to testing.
5. The contractor shall notify the client and EOR in writing a minimum of 72 hours prior to the start of testing and provide a complete testing schedule to allow for witnessing of testing.
6. Any fiber not meeting the requirements of the standard shall not be installed.

F. Multimode fiber:

1. Certification shall be performed on all fibers in the completed end to end system. Certification shall consist of a bi-directional end to end optical time domain reflectometry (OTDR) trace (all multimode strands over 100 meters) and a bi-directional end to end light-source recording power meter test (all multimode strands). All tests shall be performed in accordance with ANSI/TIA/568 and tia-526. The system loss measurements shall be provided at 850 and 1300 nanometers for all optical fibers.
2. Loss budget:

a. Contractor shall provide calculations indicating the maximum loss budget for each fiber using the following formula.

b. (Allowable cable loss per km) x (km of fiber in link) + (mfr published connector loss) x (number of connectors) = maximum allowable loss
c. The contractor shall provide loss budgets to EOR for review prior to certification.
d. Any link not meeting the requirements of the standard shall be brought into compliance by the contractor, at no cost to the client.

END OF SECTION – 271523

SECTION 311000

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Removing existing vegetation.
2. Clearing and grubbing.
3. Stripping and stockpiling topsoil.
4. Removing above- and below-grade site improvements.
5. Disconnecting, capping or sealing, and abandoning site utilities in place.

B. Related Requirements:

1. Section 015723 – “Temporary Storm Water Pollution Control" for temporary erosion- and sedimentation-control measures.

2. Section 015639 “Tree Removal and Landscape Protection” for tree removals, tree and landscape protection requirements.

1.3 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

E. Tree-Protection Zone: As defined in Section 015639 “Tree Removal and Landscape Protection”

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site in accordance with Caltrans Standard Section 5-11, “Disposal of Material Outside the Highway Right of Way”.

1.6 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.7 FIELD CONDITIONS

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

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

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

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

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

E. Tree- and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."

F. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earthwork."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Tree Removal and Plant Protection."

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

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

3.2 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

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

B. Locate, identify, and disconnect utilities indicated to be abandoned in place.

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

Revise subparagraphs below to suit Project. Change "County appointed Construction Manager" to "Owner" or other responsible party if required.

1. Notify County appointed Construction Manager not less than 10 working days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without County appointed Construction Manager's written permission.

D. Excavate for and remove underground utilities indicated to be removed.

3.3 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. Areas within the limits of work, as shown on the Plans, or as directed by the County appointed Construction Manager, shall be cleared as necessary for the construction of improvements and related work. The areas to be cleared and grubbed will not necessarily extend to all limit of work lines. The exact limits for clearing and grubbing shall be approved by the County appointed Construction Manager in advance of commencing any work.

3. Construction easements, as shown on the Plans, shall be cleared only as necessary for the construction of improvements and related work, or as directed by the County appointed Construction Manager.

4. All existing vegetation, fencing, driveways, and walks outside the areas to be cleared and grubbed, shall be protected from injury and damage resulting from the Contractor's operations.

5. Removal of any concrete improvements (sidewalks, curbs) shall be as shown on the Plans and as directed by the County appointed Construction Manager.

6. The Contractor shall take care not to damage existing facilities that are to remain. Any damage to such facilities caused by the Contractor's operations during clearing and grubbing operations, as determined by the County appointed Construction Manager, shall be repaired to the satisfaction of the County appointed Construction Manager, all at the Contractor's expense, and no additional compensation will be allowed therefore.

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

3.4 TOPSOIL STRIPPING

A. Remove sod and grass and vegetation before stripping topsoil.

B. Strip topsoil to depth indicated on in a manner to prevent intermingling with underlying subsoil or other waste materials.

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

1. Confirm location of stockpile with Owner’s appointed Construction Manager.

2. Limit height of topsoil stockpiles to 48 inches.
3. Do not stockpile topsoil within tree protection zones.

3.5 SITE IMPROVEMENTS

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

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

C. Fd

3.7 CLEAN UP

A. Nothing herein shall be construed as relieving the Contractor of his responsibility for final cleanup of thesite.

3.8 PAYMENT

A. The Contract lump sum price paid for this item, “Site Clearing,” shall include, but not be limited to, full compensation for furnishing all labor, materials, including structure backfill, as required, equipment and incidentals necessary for doing all work involved in site clearing and grubbing, including, but not limited to, the removal and disposal of concrete, fencing (or relocation and salvaging thereof), underdrain pipes, miscellaneous facilities, as shown on the Plans, and as directed by the County appointed Construction Manager, and no additional compensation will be allowed therefore.

END OF SECTION 311000

SECTION 312000

EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, pavements, athletic fields, turf and grasses and plants.
3. Excavating and backfilling for buildings and structures.
4. Subbase courses for pavements.
5. Subsurface drainage backfill for trenches.
6. Lime Treatment (for Small Multiuse Field Subgrade).

B. Related Requirements:

1. Section 013200 "Construction Progress Documentation"
2. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
3. Section 329119 “Landscape Finish Grading” for finish grading requirements.
4. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
5. Section 329300 "Plants" for planting areas and tree and shrub pit excavation and planting.
6. 5.6. Section 312100 “Utility Trenching and Backfill” for trench excavation and backfill requirements.

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

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

D. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

E. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

F. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill as defined in the Geotechnical Report.

G. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by County appointed Construction Manager.

Unauthorized excavation, as well as remedial work directed by County appointed Construction Manager, will be without additional compensation.

H. Fill: Soil materials used to raise existing grades.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other fabricated stationary features constructed above or below the ground surface.

J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

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

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct preexcavation conference at Project site.

1. Review methods and procedures related to earthwork, including, but not limited to, the following:

a. Personnel and equipment needed to make progress and avoid delays.
b. Coordination of Work with utility locator service.
c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
d. Extent of trenching by hand or with air spade.
e. Field quality control.

1.3 ACTION SUBMITTALS

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

1. Geotextiles.
2. Warning tapes.

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

1. Geotextiles: 12 by 12 inches (300 by 300 mm).

1.4 INFORMATIONAL SUBMITTALS

A. Material Test Reports: As required by Geotechnical Report.

1.5 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

1.6 FIELD CONDITIONS

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

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

B. Improvements on Adjoining Property: Authority for performing earthwork indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by County appointed Construction Manager.

C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015050 “Erosion Control” Section 015000 "Temporary Facilities and Controls" and Section 311000 "Site Clearing" are in place.

E. Do not commence earthwork operations until tree removal and protection measures specified in Section 015639 "Tree Removal and Landscape Protection" are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: According to Geotechnical Report.

C. Subbase Material: Caltrans Standard Class 2 Aggregate base.

D. Permeable Base Material: Caltrans Standard Class 2 Permeable Base

E. Drain Rock: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve, 95-100 percent passing a 1-inch (25.4-mm) sieve, 25-60 percent passing a ½-inch (12.7-mm) sieve, 0-10 percent passing a No. 4 (4.76-mm) sieve and 0-5 percent passing a No. 8 (2.36-mm) sieve.

F. Sand: ASTM C33/C33M; fine aggregate.

G. PG&E Trench Backfill: Sand or native soil to provide a smooth bedding area when installing utility facilities. The backfill must fill all of the voids around the facilities and provide at least 12 inches of cover for the conduit or pipe. PG&E considers soil that contains occasional, rounded rocks that are 1/2 inch in diameter or less to be acceptable backfill. Crushed rock or sharp-edged materials of any kind, or backfill containing easily breakable dirt clods larger than 6 inches in diameter, are not acceptable. Additionally, PG&E prohibits applicants to use backfill with rocks greater than 3 inches in any dimension within 6 inches of the top of the pipe or conduit or less than 12 inches below the pavement subgrade.

H. Quicklime: Quicklime – Quicklime shall be ASTM Designation: C 977 (Specification for Quicklime and Hydrated Lime for Soil Stabilization). Sampling shall conform to ASTM C 50. The Quicklime shall be protected from moisture until used and be sufficiently dry to flow freely when handled. Quicklime shall be furnished in bulk with product certification on the certified weigh tags.

1. When dry sieved in a mechanical sieve shaker for 10 minutes +/- 30 seconds a 250-gram test sample of Quicklime shall conform to the following grading requirements:

Sieve Size	Percentage Passing
3/8	98 - 100

2.2 GEOTEXTILES

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

1. Mirafi 140N or approved equivalent.

B. Geotextile Fabric for Vehicular AC Paving within Tree Protection Zones. Mirafi HP570 or approved equivalent.

2.3 ACCESSORIES

A. Warning Tape: Refer to requirements in Section 312100 “Utility Trenching and Backfill”.

B. Detectable Warning Tape: Refer to requirements in Section 312100 “Utility Trenching and Backfill”.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

3.3 EXCAVATION, GENERAL

Retain "Unclassified Excavation" or "Classified Excavation" Paragraph below. Retain first paragraph if excavation is unclassified and no changes in the Contract Sum or the Contract Time will be authorized for

rock excavation. Retain second paragraph if excavation is classified and adjustments in the Contract Sum and, if applicable, the Contract Time will be authorized for rock excavation. See Evaluations.

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

B. Excavations at Edges of Tree- and Within Tree Protection Zones: according to requirements in Section 015639 "Tree Removal and Landscape Protection."

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Tree Removal and Landscape Protection."

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

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

3.6 LIME TREATMENT (For Small Multiuse Field Subgrade)

A. Handling and safety: The Contractor shall obtain and enforce the lime supplier’s instructions for proper safety and handling of the lime to prevent physical eye or skin contact with lime during transport or application.

B. Proportioning / Spreading:

1. The Quicklime shall be spread in one operation to the required width, grade and cross section. Quicklime shall be evenly spread at the designated rate and shall not vary more than 5 percent on any area. Only a calibrated spreader able to provide a uniform distribution of the Quicklime throughout the treatment area shall spread the Quicklime. The Quicklime shall be added in a dry state and every precaution shall be taken to prevent dusting.
2. Tailgate spreading of the Quicklime will not be permitted. Tailgating is defined as having manual control of the spread rate, instead of automatic. The spreader truck shall demonstrate the ability to maintain a consistent spread rate over variable travel speeds.
3. The contractor will demonstrate the consistency of the spread rate by conducting a multiple pan tests. The test is 3 pans in a row with readings in tolerance
4. No traffic other than the mixing equipment or other related construction equipment will be allowed to pass over the spread Quicklime until after completion of mixing.

C. Initial Mixing
1. Mixing equipment shall be equipped with a visible depth indicator showing mixing depth, an odometer to indicate travel speed and a controllable water additive system for regulating water added to the mixture. The initial mix shall be done while introducing water (to provide moisture content about 5 percent above optimum) through a controllable pump on the mixing machine. Spread lime shall not be left exposed for more than 6 hours.
2. Mixing equipment shall be the type that can mix to the full depth of the desired thickness and leave a relatively smooth bottom of the treated section. Mixing and re-mixing, regardless of equipment used, will continue until the material is uniformly mixed, free of streaks or pockets of unhydrated Quicklime and clay clods are broken down to less than 1-inch in size. Two or more passes (1 pass = 1 coverage) with the mixer should be anticipated during initial mixing to achieve breakdown. Moisture content shall be more than 3 percent over the treated soils design optimum after the initial mixing.
3. Treated material shall not be mixed or spread while the atmospheric or soil temperature is below 35 F or below 1.67 C.

D. Mellowing and Re-Mixing
1. After initial mixing and hydration, the treated material shall mellow for a minimum of 36 hours prior to re-mixing or until the soil becomes friable. Once the mellowing period has been completed, the treated soil shall be re-mix and re-hydrated to the full depth of treatment.
2. All material other than rock or aggregate complies with the following requirements

Sieve size	Percent Passing
l"	100 Min.
#4	60 Min.

3. No color reaction of the treated material, exclusive of one inch or larger clods, is tested with the standard phenolphthalein alcohol indicator, will be considered evidence of inadequate mixing.

E. Compacting
1. The Quicklime treated soils shall be compacted to a minimum of 90 percent relative compaction determined by ASTM 1557. The maximum compacted thickness of a single layer may be any thickness the contractor can demonstrate to the Engineer that his equipment and method of operation will provide the required compacted density throughout the layer.

2. Initial compaction shall be performed by means of open ring sheepsfoot type compactor. Final rolling shall be by means of steel - drum or pneumatic - tired rollers. Areas inaccessible to rollers shall be compacted to the required compaction by other means satisfactory to the Engineer.

F. Finishing and Curing
1. After the final layer or course of lime-treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The contractor shall finish grade the compacted lime treated subgrade within 24 to 48 hours of the final compaction of the lime treated section. The contractor shall not use the finished subgrade as a "haul road" or other similar use and shall keep heavy construction equipment off the finished subgrade until the Aggregate Base is placed and compacted. The completed section shall then be finished by rolling, as directed by the Engineer, with a pneumatic or other suitable roller sufficiently light to prevent hairline cracking. The finished surface shall not vary more than 3/8 inch (9 mm) when tested with a 12 feet (3.7
m) straightedge applied parallel with and at right angles to the pavement centerline. Any variations in excess of this tolerance shall be corrected by the Contractor in a manner satisfactory to the Engineer, and the cost shall be incidental to this item.
2. The contractor shall periodically (1 to 3 times) daily water the top of the subgrade to reduce the potential for drying out the lime treated subgrade during the curing period until the baserock is placed.
3. The completed lime treated section shall be moist-cured for a minimum of seven (7) days before further courses are added or any traffic is permitted, unless otherwise directed by the Engineer.

G. Maintenance: The Contractor shall protect and maintain the lime-treated subgrade from yielding until the lime-treated subgrade is covered by placement of the next layer. The cost of this maintenance shall be incidental to this item.

3.7 SUBGRADE INSPECTION

A. Notify County appointed Construction Manager when excavations have reached required subgrade.

B. If County appointed Construction Manager or Geotechnical determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below paving to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction[, repeating proof-rolling in direction perpendicular to first direction]. Limit vehicle speed to 3 mph (5 km/h).
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by County appointed Construction Manager, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by County appointed Construction Manager, without additional compensation.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within Tree Protection Zones

3.9 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainagr.
2. Testing and inspecting underground utilities.
3. Removing concrete formwork.
4. Removing trash and debris.
5. Removing temporary shoring, bracing, and sheeting.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.11 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction. Moisture requirements should follow the geotechnical report recommendations in section 6.8, Table 3.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content. Refer to section 6.6 of the geotechnical report for additional wet soil stabilization recommendations.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D1557:

1. Under structures, building slabs, steps, and pavements: As defined in the Geotechnical Report.
2. Under Synthetic Turf Field: As defined in the Geotechnical Report and Supplemental Recommendations for Synthetic Turf Field.
3. For utility trenches: As defined in the Geotechnical Report.
4. Under turf or unpaved areas, scarify and recompact top 3 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.

3.13 GRADING

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

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

3.14 SUBSURFACE DRAINAGE

A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch (150-mm) course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches (300 mm) of filter material, placed in compacted layers 6 inches (150 mm) thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).

B. Drain Rock: Carefully place material in layers not exceeding 12-inch lifts and compact each layer with a minimum of 4 passes. Compaction shall be achieved by means of mechanical vibratory compaction using vibratory plate compactors. Do not compact by ponding, flooding or jetting.

C.

3.15 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course[and base course] under pavements and walks as follows:

1. Place base course material over subbase course under hot-mix asphalt pavement.
2. Shape subbase course to required crown elevations and cross-slope grades.
3. Place subbase course 6 inches or less in compacted thickness in a single layer.
4. Place subbase course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
5. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness as defined in the Geotechnical report.

C. Pavement Shoulders: Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase.

D. Re-use of existing aggregate base: If existing aggregate base is to be reused as aggregate base, a sample of the aggregate base is to be submitted for Caltrans Class 2 AB testing, Section 26 of the Standard Specifications.

3.16 FIELD QUALITY CONTROL

A. Geotechnical Observations: Owner will engage the geotechnical engineer of record and their representative testing agency to perform the following observations:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material classification and maximum lift thickness comply with requirements.
3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.
4. Observe foundation excavations prior to placement of steel reinforcement and concrete placement for dimension and geotechnical compliance.

B. Allow testing agency to observe and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by County appointed Construction Manager.

D. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable.
   1. Frequencies will be determined by geotechnical engineer and their representative based on site conditions.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

F. Drain Rock Testing/Inspection: Visual observation for approximately 1”/lift, equivalent to 8% settlement to achieve compaction.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

   1. Scarify or remove and replace soil material to depth as directed by County appointed Construction Manager; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by County appointed Construction Manager.

   1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 312100

UTILITY TRENCHING AND BACKFILL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Excavation, bedding, and backfill for underground storm drain, sanitary sewer, and water piping, underground HVAC piping, electrical conduit, telephone conduit, gas piping, cable TV conduit, etc., and associated structures.

B. Provide labor, material, equipment, and services necessary to complete the backfilling and compacting as necessary for this project. Section includes, but is not limited to:
   1. Select Backfill Material
   2. Aggregate Base
   3. Detectable Tape
   4. Trench Excavation
   5. Pipe Bedding
   6. Trench Backfill
   7. Trench Surfacing

C. This section excludes drainage fill material and placement around subdrains. See Section 334600 – Landscape Drainage.

1.2 RELATED SECTIONS

A. Section 311000 – Site Clearing

B. Section 312000 – Earthwork

C. Section 331900 – Water System

D. Section 333000 – Sanitary Sewer System

E. Section 334600 – Landscape Drainage

1.3 RELATED DOCUMENTS

A. Geotechnical Report: Geotechnical Investigation Reimagine Flood Park 215 Bay Road Menlo Park, California prepared by Cornerstone Earth Group dated June 27, 2022.

B. ASTM

   1. D1557, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

2. D2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewer and Other Gravity-Flow Applications.

C. California Administrative Code, Title 24, Part 2 - Basic Building Regulations, Chapter 24, Excavations, Foundations, and Retaining Walls.

D. Caltrans Standard Specifications, 2015
1. Section 19, Earthwork
2. Section 26, Aggregate Bases
3. Section 68, Subsurface Drains
4. Section 96, Geosynthetics

E. CAL/OSHA, Title 8

1.4 DEFINITIONS

A. AC: Asphalt Concrete

B. ASTM: American Society for Testing and Materials

C. Base: The layer placed between the subgrade and surface pavement in a paving system.

D. Bedding: Material from bottom of trench to bottom of pipe

E. CDF: Controlled Density Fill

F. DIP: Ductile Iron Pipe

G. Engineered Fill:
1. Soil or soil-rock material approved by the Owner and transported to the site by the Contractor in order to raise grades or to backfill excavations.
2. Contractor shall provide sufficient tests, and a written statement that all materials brought onto the project site comply with specification requirements.

H. Excavation: Consists of the removal of material encountered to subgrade elevations

I. Initial Backfill: Material from bottom of pipe to 12 inches above top of pipe

J. PCC: Portland Cement Concrete

K. RCP: Reinforced Concrete Pipe

L. Relative Compaction: In-place dry density of soil expressed as percentage of maximum dry density of same materials, as determined by laboratory test procedure ASTM D1557.

M. Springline of Pipe: Imaginary line on surface of pipe at a vertical distance of ½ the outside diameter measured from the top or bottom of the pipe.

N. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below base.

O. Subsequent Backfill: Material from 12 inches above top of pipe to subgrade of surface material or subgrade of surface facility or to finish grade.

P. 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 Engineer.
   2. Unauthorized Trench Over-Excavation: Excavation below trench subgrade elevations or beyond indicated horizontal trench dimensions without authorization by the Geotechnical Engineer. Unauthorized excavation shall be without additional compensation.

Q. Utility Structures:
   1. Storm drainage manholes, catch basins, drop inlets, curb inlets, vaults, etc.
   2. Sanitary sewer manholes, vaults, etc.
   3. Water vaults, etc.

1.5 SUBMITTALS

A. Follow submittal procedures outlined in Division 1, General Requirements.

B. Test Reports: Submit the following report for import material directly to the Owner from the Contractor's testing services:
   1. Compaction test reports for aggregate base.

C. Samples:
   1. If required by the Geotechnical Engineer, provide 20-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 Engineer and the Owner.
   2. Provide materials from same source throughout work. Change of source requires approval of the Geotechnical Engineer and the Owner.

1.6 QUALITY ASSURANCE

A. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Engineer.

B. Conform all work to the appropriate portion(s) of the Caltrans Standard Specifications, Section 19, Earthwork.

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 Engineer will perform observations and tests required to enable him to form an opinion of the acceptability of the trench backfill. Correct the trench backfill that, in the opinion of the Geotechnical Engineer, does not meet the requirements of these Technical Specifications and the Geotechnical Report.

E. Soil Testing:
   1. Contractor to engage a geotechnical testing agency, to include compaction testing and for quality control testing during fill operations.
   2. Test results will be submitted to the Owner.

1.7 PROJECT CONDITIONS

A. Promptly notify the Owner of surface or subsurface conditions differing from those disclosed in the Geotechnical Report. First notify the Owner 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 Owner in writing of differing conditions prior to contractor starting work on affected items.

B. Barricade open excavations and post with warning lights.
   1. Operate warning lights and barricades as required.
   2. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout, and other hazards.
   3. 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 Division 1, General Requirements.

E. Environmental Requirements:
   1. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District.
   2. Protect existing streams, ditches and storm drain inlets during work on this project.

F. Protection of Subgrade: Do not allow equipment to pump or rut subgrade, stripped areas, footing excavations, or other areas prepared for project.

G. Transport all excess soils materials by legally approved methods to disposal areas.
   1. Coordinate with the Engineer.
   2. Any additional fill requirements shall be the responsibility of the Contractor.

1.8 EXISTING UTILITIES

A. Locate existing underground utilities in the areas of work. For utilities that are to remain in place, provide adequate means of protection during excavation operations.
   1. Locating of existing underground utilities shall include but not be limited to pot-holing prior to the start of construction.

B. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult Owner and/or utility agency immediately for directions.
   1. Cooperate with the Owner and public and private utility companies in keeping their respective services and facilities in operation.

2. Repair damaged utilities to the satisfaction of the agency with jurisdiction.

C. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Owner and then only after acceptable temporary utility services have been provided.

PART 2 - PRODUCTS

2.1 GENERAL

A. Import materials will be subject to approval of the Geotechnical Engineer.

B. For approval of imported fill material, notify the Owner at least 7 days in advance of intention to import material.

2.2 PIPE BEDDING AND INITIAL BACKFILL

A. ASTM D2321, Class IA, IB or II.
1. Clean and free of clay, silt or organic matter.

B. Permeable Material: In accordance with Section 68-2.02F of Caltrans Standard Specifications, Class 1, Type A or Class 2.

C. Class 2 Aggregate Base: In accordance with Section 26 of Caltrans Standard Specifications, ¾ inch maximum.

D. Sand: In accordance with Section 19-3.02F of Caltrans Standard Specifications.

2.3 SELECT BACKFILL

A. Select backfill material shall be gravel, free of clay or organic matter and shall conform to the following gradation:

Sieve Size	Percentage Passing
1 inch	100
¾ inch	90 – 100
No. 4	35 – 60
No. 200	2 - 9

B. For gas pipe and fuel piping select backfill shall be clean, graded building sand conforming to the following gradation:

Sieve Size	Percentage Passing
No. 4	100
No. 200	0 -5

2.4 WARNING TAPE

A. Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 6-inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

1. Warning Tape Color Codes
    a. Red: Electric
    b. Yellow: Gas, Oil; Dangerous Materials
    c. Orange: Telephone and Other Communications
    d. Blue: Water Systems
    e. Green: Sewer Systems
    f. White: Steam Systems
    g. Gray: Compressed Air
2. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.
3. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.5 DETECTION WIRE FOR NON-METALLIC PIPING

A. Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

2.6 SUBSEQUENT BACKFILL

A. Conform to on-site or imported structural backfill in Section 312000, Earthwork.

2.7 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 C150, Type II Cement.

C. Fly Ash: Conform to the standards as set forth in ASTM C618, 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 C260.

E. Aggregates need not meet the standards as set forth in ASTM C33. 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 Engineer’s approval.

2.8 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 Engineer.

B. Poured-in-Place Structures:
1. Bedding: Bedding shall meet the approval of the Geotechnical Engineer. 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. Side Backfill: On-site or imported structural fill meeting the requirements given in Section 312000, Earthwork.

2.9 GEOSYNTHETICS

A. Filter Fabric:

1. Filter Fabric: Geosynthetics used for filter fabric must be permeable and nonwoven. Filter fabric must be manufactured from one of the following:
   a. Polyester
   b. Polypropylene
   c. Combined polyester and polypropylene

2. Filter fabric must comply with the requirements shown in the following table:

Quality Characteristic	Test Method	Requirement		
		Class A	Class B	Class C
Permittivity, (min, sec^{-1})	ASTM D4491	0.5	0.2	0.1
Apparent opening size, average roll value, (max, US standard sieve size)	ASTM D4751	40	60	70
Grab breaking load, 1-inch grip, in each direction, (min, lb)	ASTM D4632	157		
Apparent elongation, in each direction, (min, percent)	ASTM D4632	50		
Puncture strength, (min, lb)	ASTM D6241	310		
Trapezoid tearing strength, (min, lb)	ASTM D4533	56		
UV resistance, retained grab breaking load, 500 hours, (min, percent)	ASTM D4355	70		

3. Mirafi 140N, Mirafi Inc., or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Comply with the recommendations of the Geotechnical Engineer.

B. Protect existing trees to remain. No grading is permitted under the drip line of protected trees.

C. Excavations for appurtenant structures, such as, but not limited to, manholes, transition structures, junction structure, vaults, valve boxes, catch basins, thrust blocks, and boring pits, shall be deemed to be in the category of trench excavation.

D. Unless otherwise indicated in the Plans, all excavation for pipelines shall be open cut.

E. Prior to commencement of work, become thoroughly familiar with site conditions.

F. In the event discrepancies are found, immediately notify the Owner in writing, indicating the nature and extent of differing conditions.

G. Backfill excavations as promptly as work permits.

H. Do not place engineered fill or backfill until rubbish and deleterious materials have been removed and areas have been approved by the Owner.

I. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

J. In excavations, use satisfactory excavated or borrow material.

K. Under grassed areas, use satisfactory excavated or borrow material.

3.2 SITE PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, which are to remain, from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the Owner.

3.3 EXISTING UTILITIES

A. Identity the location of existing utilities.
   1. Prior to trenching, the Contractor shall excavate at locations specifically indicated on the Plans, if any, and where new lines cross other utilities of uncertain depth and determine the elevation of the utility in question to ensure that the new line will clear the potential obstruction.
   2. The Contractor shall contact Underground Service Alert (USA) at 1-800-227-2600 for assistance in locating existing utilities.
   3. If, after the excavation, a crossing utility does present an obstruction, then the line and grade of the new line will be adjusted as directed by the Owner to clear the utility.

B. Protect all existing utilities to remain in operation.

C. Movement of construction machinery and equipment over existing pipes and utilities during construction shall be at Contractor’s risk.

D. Excavation made with power-driven equipment is not permitted within 2 feet of any known utility or subsurface structure.
   1. Use hand or light equipment for excavating immediately adjacent to known utilities or for excavations exposing a utility or buried structure.
   2. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.
   3. Support uncovered lines or other existing work affected by excavation until approval for backfill is obtained.
   4. Report damage of utility line or subsurface structures immediately to the Owner.

E. Backfill trenches resulting from utility removal in lifts of 8 inches maximum.

3.4 TRENCH EXCAVATION

A. General
   1. Excavation shall include removal of all water and materials that interfere with construction. The Contractor shall remove any water which may be encountered in the trench by

pumping or other methods during the pipe laying, bedding and backfill operations. Material shall be sufficiently dry to permit approved jointing.

2. Excavation shall include the construction and maintenance of bridges required for vehicular and pedestrian traffic, support for adjoining utilities.
3. The Contractor shall be responsible to safely direct vehicular and pedestrian traffic through or around his/her work area at all times.
4. The Contractor shall relocate, reconstruct, replace or repair, at his/her own expense, all improvements which are in the line of construction or which may be damaged, removed, disrupted or otherwise disturbed by the Contractor.

B. Existing Paving and Concrete:
1. Existing pavement over trench shall be sawcut, removed, and hauled away from the job. Existing pavement shall be neatly sawcut along the limits of excavations.
2. Existing concrete over the trench shall be sawcut to a full depth in straight lines, at a minimum distance of 12 inches beyond the edge of the trench, either parallel to the curb or at right angles to the alignment of the sidewalk.
3. Boards or other suitable material shall be placed under equipment outrigging to prevent damage to paved surfaces.

C. Trench Width:
1. The maximum allowable trench widths at the top of the all pipe materials outside diameter of barrel pipe plus 18 inches. shall be as follows:
   a. The maximum trench width shall be inclusive of all shoring.
   b. If the maximum trench width is exceeded, the State's representative may direct the Contractor to encase or cradle the pipe in concrete at no additional charge.
2. For pipes 3-inch diameter and larger, the free working space on each side of the pipe barrel shall not be less than 6 inches.

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 Engineer.
2. Nominal pipe diameter of 30 inches through 36 inches: Minimum of the outside pipe diameter plus 2 feet, or as otherwise allowed or required by the Geotechnical Engineer.
3. Nominal pipe diameter of 42 inches through 60 inches: Minimum of the outside pipe diameter plus 3 feet, or as otherwise allowed or required by the Geotechnical Engineer.

E. Open Trench:
1. The maximum length of open trench shall be 300 feet or the distance necessary to accommodate the amount of pipe installed in a single day, whichever is greater. No trench shall be left open at the end of the day.
2. Provisions for trench crossings and free access shall be made at all street crossings, driveways, water gate valves, and fire hydrants.
3. 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.
4. Excavation Depth for Bedding: Minimum of 6 inches below bottom of pipe or as otherwise allowed or required by the Geotechnical Engineer, except that bedding is not required for nominal pipe diameters of 2 inches or less.
5. Over-Excavations: Backfill trenches that have been excavated below bedding design subgrade, with approved bedding material.

6. Where forming is required, excavate only as much material as necessary to permit placing and removal of forms.
7. 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.

F. Excavated Material:
1. All excavated material not required for backfill shall be immediately removed and properly disposed of in a legal manner by the Contractor.
2. Material excavated in streets and roadways shall be laid alongside the trench no closer than 2 feet from the trench edge and kept trimmed to minimize inconvenience to public traffic.
3. Provisions shall be made whereby all storm and wastewater can flow uninterrupted in gutters or drainage channels.

3.5 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 Engineer and the Owner 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 Engineer’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.

3.6 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 Owner, submit details and calculations to the Owner. The Owner may forward the submittal to the Geotechnical Engineer, 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 Owner.

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.

3.7 PIPE BEDDING

A. Obtain approval of bedding material from the Geotechnical Engineer.

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 Engineer. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Engineer. Jetting or ponding of bedding material will not be permitted.

C. Stabilization of Trench Bottom: When the trench bottom is unstable due to wet or spongy foundation, trench bottom shall be stabilized with gravel or crushed rock. The State's inspector will determine the suitability of the trench bottom and the amount of gravel or crushed rock needed to stabilize a soft foundation. Soft material shall be removed and replaced with gravel or crushed rock as necessary.

D. Placement of Bedding Material: The trench bottom shall be cleaned to remove all loose native material prior to placing select backfill material. Sufficient select backfill material shall be placed in trench and tamped to bring trench bottom up to grade of the bottom of pipe. The relative compaction of tamped material shall be not less than 90 percent. It is the intention of these requirements to provide uniform bearing under the full length of pipe to a minimum width of 60 percent of the external diameter.

3.8 BACKFILLING

A. Initial Backfill:
   1. Obtain approval of backfill material from Geotechnical Engineer.
   2. 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 bedding material at optimum water content to 90% relative compaction unless specified otherwise on the Plans or by the Geotechnical Engineer. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Engineer. Jetting or ponding of initial backfill material will not be permitted.

B. Pipe Detection: In trenches containing pressurized plastic pipes, tracer wire shall be placed directly above the pipe and shall be connected to all valves, existing exposed tracer wires, and other appurtenances as appropriate.

C. Installation of Tracer Wire:
   1. Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe.
   2. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.

3. Form a mechanically and electrically continuous line throughout the pipeline, extending to the nearest valve or other pipeline appurtenance. Extend the wire up the outside of the valve box/riser and cut a hole that is 8 inches from the top, extend a 12-inch wire lead to the inside of the box. At other pipeline appurtenances, terminate the 12-inch wire lead inside the enclosure.
4. Splice wire with a splicing device consisting of and electro-tin-plated seamless copper sleeve conductor. Install as recommended by the manufacturer. Wrap splices and damaged insulation with electrician's tape.

D. Installation of Warning Tape
1. Install tape approximately 1 foot above and along the centerline of the pipe.
2. Where tape is not continuous lap tape ends a minimum of 2 feet.

E. Subsequent Backfill:
1. Above the level of initial backfill, the trench shall be backfilled with non-expansive native material from trench excavation or with imported select backfill material (Contractor's option). Subsequent backfill shall be free of vegetable matter, stones or lumps exceeding 3 inches in greatest dimension, and other unsatisfactory material.
2. 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 bedding material at optimum water content to 90% relative compaction, except that the upper 36 inches in areas subject to vehicular traffic shall be compacted to at least 95% relative compaction, unless specified otherwise on the Plans or by the Geotechnical Engineer. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Engineer. Jetting or ponding of subsequent backfill material will not be permitted.

F. Do not use compaction equipment or methods that produce horizontal or vertical earth pressures that may cause excessive pipe displacement or damage the pipe. Jetting of trench backfill is not permitted.

G. Utility backfill shall be inspected and tested by the Geotechnical Engineer during placement. Cooperate with the Geotechnical Engineer 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 Engineer and the Owner prior to proceeding with the Project.

H. Compaction testing shall be in accordance with California Test Method ASTM D1556 or D1557.

3.9 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 Owner.

END OF SECTION – 312100

SECTION 320190

OPERATION AND MAINTENANCE OF PLANTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Work Included: Provide continuous Landscape Maintenance, complete as specified during progress of the work, after installation, and for a minimum period of (90 days) after Preliminary Acceptance, and as required by warranty and Article 3.9, Termination of the Maintenance Period.

B. Related Sections include:

1. Section 015639 “Tree Removal and Landscape Protection”
2. Section 329119 “Landscape Finish Grading”
3. Section 328400 “Irrigation Systems”
4. Section 329113 “Soil Preparation”
5. Section 329200 “Turf and Grasses”
6. Section 329400 “Planting Accessories”

1.3 SUBMITTALS

A. Quality Control Submittals:

1. Schedule of maintenance operations and monthly status report including list of equipment, materials proposed for the job.
2. Licenses, permits and insurances required by County, State or Federal government pertaining to maintenance work.
    a. Herbicides, Pesticide, and Fungicide shall be applied by a Qualified Applicator, licensed by the California Department of Pesticide Regulation. Submit proof of licensure.
3. Monthly record of all herbicides, insecticides and disease control chemicals used for the project.
4. Written application recommendation by a licensed agricultural pest control advisor for all weed, pest and disease controls restricted by the Director of Agriculture proposed for this work.
5. Schedule of recommended annual fertilizer and soil conditioning program provided by Soils Testing Lab based on plant schedule and testing of soils.

B. Project Close-out Submittal: Include in a single, 3-ring binder a landscape maintenance manual containing an indexed collection of all schedules, records and permits listed above, as well as a documentation of accepted condition of planting and irrigation at Final Acceptance.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Experience: The landscape contractor or maintenance subcontractor shall have a full-time employee assigned to the job as foreman for the duration of the contract. He/she shall have a minimum of ten (10) years of experience in landscape maintenance supervision, with experience or training in turf management, entomology, pest control, soils, fertilizers and plant identification.
2. Labor Force: The landscape maintenance labor force shall be thoroughly familiar with, and trained in, the work to be accomplished and shall perform the task in a competent, efficient manner acceptable to the Owner.
3. Irrigation Systems Manager: The landscape contractor shall assign an irrigation systems manager to setup the central irrigation control system, establish and monitor the irrigation sequence, duration, and frequency for the duration of the contract. The irrigation manager shall have a minimum of ten (10) years of experience in landscape management and the operation of centrally controlled irrigation systems and shall be trained by the specified irrigation control manufacturer in the operation of the specified system.

B. Requirements:

1. Supervision: The foreman shall directly supervise the work force at all times. Notify Owner of all changes in supervision.
2. Identification: Provide proper identification at all times for landscape maintenance firm's vehicles and labor force. Be uniformly dressed in a manner satisfactory to the Owner.

1.5 PROJECT / SITE CONDITIONS

A. Site Visit: At beginning of maintenance period, visit and walk the site with the Landscape Architect to clarify scope of work and understand existing project/site conditions.

B. Documentation of Conditions: Document general condition of existing trees, shrubs, vines, groundcovers and lawn recording all plant materials which are healthy, thriving, damaged, dead or dying.

C. Irrigation System: Document general condition of existing irrigation system, making sure that faulty electrical controllers, broken or inoperable sprinkler heads or emitters are reported.

1.6 SEQUENCING AND SCHEDULING

A. Perform all maintenance during hours mutually agreed upon between Owner and Contractor.

B. Work force shall be present at the project site at least once a week and as often as necessary to perform specified maintenance in accordance with the approved maintenance schedule.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: All materials and equipment, shall be provided by the Contractor, except as specified below.

B. Water: Clean, potable and fresh, as available from Owner.

C. Fertilizers:

1. As indicated in recommendations in soils analysis submitted under “Soil Preparation” Section.

D. Pesticides including Herbicides, Insecticides, and Fungicides:

1. As approved by the Owners Representative and consistent with the County of San Mateo Integrated Pest Management Policies included as supplemental documents.
2. Pesticide use shall be in accordance with established guidelines, and treatments shall be made with the goal of removing only target organisms. Pest control materials shall be selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment.
3. Best quality materials with original manufacturers' containers, properly labeled with guaranteed analysis.
4. Use non-staining materials.

E. Perennials/groundcovers: Nursery-grown in specified sizes, full, healthy plants.

F. Replacement Tree Stakes and Ties: Match originally accepted existing materials on the site.

2.2 EQUIPMENT

A. General: Use only the proper tool for each job. Maintain all tools in sharp, properly-functioning condition. Clean and sterilize pruning tools prior to usage.

B. Insect/Disease Prevention: Take all acceptable measures to prevent introduction of insect or disease-laden materials onto the site.

PART 3 - EXECUTION

3.1 ESTABLISHING THE MAINTENANCE PERIOD

A. Preliminary Review: As soon as planting is substantially completed per documents, hold a preliminary review to determine the condition of the work.

B. Date of Review: Notify Landscape Architect at least five (10) workings days prior to anticipated date of review.

C. Beginning of the Maintenance Period: The date on which the Landscape Architect issues a letter of Preliminary Acceptance to the Contractor.

1. The beginning of the Maintenance Period shall be established based on completion of requirements defined Section 329200 “Planting” and Section 329300 “Turf and Grasses” The later date of completion shall set the date of preliminary acceptance.

D. Ending of the Maintenance Period: The date on which the Landscape Architect issues a letter of Final Acceptance to the Contractor.

3.2 PREPARATION

A. Protection:

1. Protect all new planting areas from damage of all kinds from beginning of work until sufficiently established or until Final Acceptance.
2. Provide temporary protection fences, barriers and signs as required for protection.

B. Replacements:

1. Immediately treat or replace all plants, which become damaged or injured as a result of Contractor’s operations or negligence, as, directed by Landscape Architect, at no cost to Owner.
2. Replacement plants shall match size, condition and variety of plants replaced.

3.3 PLANTING

A. Watering Basins:

1. For supplemental hand watering of watering basins. Do not permit use of "jet" type watering equipment. Do not permit crown roots to become exposed to air through dislodging of soil and mulch.
2. Maintain originally called for depth of mulch to reduce evaporation and frequency of watering.
3. In rainy season, open basins to allow surface drainage away from the root crown where excess water may accumulate. Restore watering basins at end of rainy season.

B. Resetting: Reset plants to proper grades and upright position.

C. Weed Control:

1. All areas between plants, including watering basins, shall be weed free at all times.
2. Use only recommended and legally approved organic, nontoxic methods or herbicides to control weed growth.
3. Avoid frequent soil cultivation that destroys shallow roots and breaks the seal of pre-emergent herbicides.

D. Understory Infill and Replanting: Replace dead and missing plants. Provide infill and supplemental plants as required to maintain plant coverage as indicated in plans. Bare areas shall be infilled as follows:

1. General planting and Shrub areas: All bare areas shall be infilled or replaced based on plant spacing in planting plans.
2. Ground cover and Grassland Planting areas: All bare areas areas larger than 2 x 2 feet shall be infilled.
3. Perennial Areas: All bare areas areas larger than 18 x 18 inches shall be infilled or replaced.

E. Tree Care and Pruning: A preapproved tree care specialist shall be responsible for tree care and pruning of all trees.

1. Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached, and which have vertical spacing of 18 in. to 48 in. and radial orientation so as not to overlay one another.
2. Prune trees to eliminate diseased or damaged growth, and narrow V-shaped branch forks that lack strength. Reduce toppling and wind damage by thinning out crowns.
3. Prune trees to maintain growth within space limitations, maintaining a natural appearance and balancing crown with roots.
4. No stripping of lower branches ("raising up") of young trees will be permitted.
5. Retain lower branches in a "tipped back" or pinched condition to promote caliper trunk growth (tapered trunk). Do not cut back to fewer than six buds or leaves on such branches. Only cut lower branches flush with the trunk after the tree is able to stand erect without staking or other support.
6. Thin out and shape evergreen trees when necessary to prevent wind and storm damage. Do primary pruning of deciduous trees during the dormant season. Do not permit any pruning of trees prone to excessive "bleeding" during growth season.
7. Prune damaged trees or those that constitute health or safety hazards at any time of year as required.
8. Make all cuts clean and close to the trunk, without cutting into the branch collar. "Stubbing" will not be permitted. Cut smaller branches flush with trunk or lateral branch. Make larger cuts (1 in. in diameter or larger) parallel to shoulder rings, with the top edge of the cut at the trunk or lateral branch.
9. Branches too heavy to handle shall be precut in three stages to prevent splitting or peeling of bark. Make the first two cuts 18 in. or more from the trunk to remove the branch. Make the third cut at the trunk to remove the resulting stub.
10. Do not prune or clip shrubs into balled or boxed forms unless specifically called for by design.
11. Take extreme care to avoid transmitting disease from one infected plant to another. Properly sterilize pruning tools before going from one infected plant to all other plants.
12. Pruning Season: Prune tree’s during dormant season consistent with arboricultural standards for species to be pruned.

F. Staking and Guying of Trees:

1. Inspect stakes and ties at least once a month to check for rubbing that causes bark wounds.
2. Inspect guy wires and ties at least once a month to check for proper tension and prevent girdling that causes bark wounds. Guy wires will require frequent adjustment during the establishment period when trees are growing rapidly.

3.4 GROUNDCOVERS

A. Watering:

1. Check for moisture penetration throughout the root zone at least twice a month.
2. Water as frequently as necessary to maintain healthy growth of groundcovers.

B. Weed Control:

1. Control weeds, with pre-emergent herbicides and with selective systemic herbicides.
2. Minimize hoeing of weeds in order to avoid plant damage.

C. Fertilization:

1. Verify specific plant requirements, if any.
2. Recently installed plant materials: Verify with Owner actual completion date of planting installation and rate of prior application of fertilizers.
3. Apply complete fertilizer as recommended by Architect and/or project horticulturist
4. Apply fertilizers and soil conditioner products as recommended by soils analysis submitted under Landscape Soils.
5. Established Plant Materials: Do not use complete fertilizers unless soil test shows specific nutrient deficiencies.

3.5 GRASS AND PERENNIAL MEADOWS

A. Refer to Section 329200 “Turf and Grasses”

3.6 INSECTS, PESTS, AND DISEASE CONTROL

A. Inspection: Inspect all plant materials for signs of stress, damage and potential trouble from the following:

1. Presence of insects, moles, gophers, ground squirrels, snails and slugs in planting areas.
2. Discolored or blotching leaves or needles.
3. Unusually light green or yellowish green color inconsistent with normal green color of leaves.

3.7 IRRIGATION SYSTEM

A. General:

1. Repair without additional charge to Owner all damages to system caused by Contractor's operations. Perform all repairs within one (1) watering period.
2. Report promptly to Owner all accidental damage not resulting from Contractor's negligence or operations.
3. Set and program automatic controllers for seasonal water requirements for each planting type and valve.
4. Twice a month, use a probe or other acceptable tool to check the rootball moisture of representative plants as well as the surrounding soil.

B. Cleaning and Monitoring the System:

1. Continually monitor the irrigation systems to verify that they are functioning properly as designed. Make program adjustments required by changing field conditions.
2. Clear irrigation systems as often as necessary to keep the irrigation systems free of sand and other debris. At least three times after the installation is complete. Once at the end of the installation, once at the beginning of the maintenance period, and once at the conclusion of the maintenance period and acceptance of the landscaping.
3. Prevent spraying on windows, building walls, (game courts) by balancing the throttle control on the remote control valves and the adjustment screws on the sprinkler heads. Do not allow water to atomize and drift.

3.8 TERMINATION OF THE MAINTENANCE PERIOD

A. Final Acceptance Procedure:

1. Work will be accepted by the Landscape Architect upon satisfactory completion of all work, including maintenance period, but exclusive of replacement of materials under the Warranty Period.
2. Submit a written request to Landscape Architect for review for Final Acceptance at least five (5) working days prior to anticipated Final Review date, which is at the end of the Maintenance Period.
3. Submit maintenance operations manual to Owner.

B. Corrective Work:

1. Work requiring corrective action or replacement shall be performed within ten (30) calendar days after the Final Review.
2. Perform corrective work and materials replacement in accordance with the Drawings and Specifications, and shall be made by the Contractor at no cost to the Owner.
3. After corrective work is completed, the Contractor shall again request a Final Review for Final Acceptance as outlined above.
4. Continue maintenance of all landscaped areas until such time as all corrective measures have been completed and accepted.

C. Conditions for Acceptance of Work at End of Maintenance Period:

1. Each plant shall be alive and thriving, showing signs of growth and no signs of stress, disease, or any other weaknesses.
2. Replace all plants not meeting these conditions. An additional Warranty Period equal in length to the original shall be commenced for all such plants and planted areas.

D. Final Acceptance Date: The date on which the Landscape Architect issues a Letter of Final Acceptance. Upon Final Acceptance, the Owner will assume responsibility for maintenance of the work.

3.9 CLEANING

A. Dispose of all pruned materials, vacuum all lawn clippings and leaves, sweep all walkways and rake smooth all mulched areas.

B. Remove from the site all containers and evidence of maintenance activities.

3.10 CLOSE OUT

A. Landscape Maintenance and Operations Manual: Submit binder to Owner with all documentation and records required and utilized during the maintenance period with recommended operations and maintenance procedures and schedules.

B. Keys and Identification: Return all keys and identification materials supplied by Owner for the purpose of site access.

END OF SECTION 320190

SECTION 321100

PAVEMENT BASE COURSE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Aggregate base

1.2 RELATED SECTIONS

A. Division 1, General Requirements

B. Section 015050, Erosion Control

C. Section 312000, Earthwork

1.3 RELATED DOCUMENTS

A. Geotechnical Report: Geotechnical Investigation Reimagine Flood Park 215 Bay Road Menlo Park, California prepared by Cornerstone Earth Group dated June 27, 2022.

B. ASTM:

1. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
2. D3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
3. E329, Specification for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
4. E548, Guide for General Criteria Used for Evaluating Laboratory Competence

C. Caltrans Standard Specifications, 2015

1. Section 24, Stabilized Soils
2. Section 25, Aggregate Subbases
3. Section 26, Aggregate Bases
4. Section 27, Cement Treated Bases

1.4 DEFINITIONS

A. Geotechnical Testing Agency: An independent testing agency qualified according to ASTM E329 to conduct soil materials and rock definition testing, as documented according to ASTM D3740 and ASTM E548.

B. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material ¾ cubic yards or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D1586, exceeds a standard penetration resistance of 100 blows/2 inches.

C. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below grade.

D. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, base or topsoil materials. Perform work in accordance with Section 312000, Earthwork.

1.5 SUBMITTALS

A. Follow submittal procedure outlined in Division 1, General Requirements.

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.

1.6 QUALITY ASSURANCE

A. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Engineer.

B. 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 D1557.

C. Perform installation of base materials under the observation of the Geotechnical Engineer. Materials placed without approval of the Geotechnical Engineer will be presumed to be defective and, at the discretion of the Geotechnical Engineer, shall be removed and replaced at no cost to the Owner. Notify the Geotechnical Engineer at least 24 hours prior to commencement of base material installation and at least 48 hours prior to testing.

D. Do not mix or place cement treated base when the temperature is below is below 36 degrees F or when the ground is frozen.

E. Do not project the finish surface of aggregate subbase above the design subgrade.

F. Finish grade tolerance at completion of base installation: +0.05 feet

1.7 PROJECT CONDITIONS

A. Protect open excavations, trenches, and the like with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.

B. Temporarily stockpile material in an orderly and safe manner and in a location approved by the Owner.

C. Provide dust and noise control in accordance with Division 1, General Requirements.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE

A. Material: Class 2, ¾ inch maximum in accordance with Caltrans Standard Specification Section 26, Aggregate Bases.

B. Material shall consist of reclaimed aggregate material up to 50% of the total volume whenever possible.

PART 3 - EXECUTION

3.1 GENERAL

A. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.

B. The Contractor shall notify the County a minimum of one (1) working day prior to when compacted materials are ready to be tested. The County pays for Contractor's call for first test only. Should the first test fail, or the County appointed Construction Manager to perform the first test arrive and the Contractor not be ready for the test, then all subsequent tests will be paid for by the Contractor until the desired compaction is reached, and no additional compensation will be allowed therefore.

3.2 WET WEATHER CONDITIONS

A. Do not place or compact subgrade if above optimum moisture content.

B. If the Geotechnical Engineer allows work to continue during wet weather conditions, conform to supplemental recommendations provided by the Geotechnical Engineer.

3.3 AGGREGATE BASE

A. Spreading

1. Deliver uniform mixtures of aggregate base to the roadbed. Deposit aggregate base in layers or windrows. Spread and shape the aggregate base to such thickness that after watering and compacting, the completed aggregate base is within the tolerances specified in Section B below. When the aggregate base is spread and compacted the moisture content must be uniform and sufficient to obtain the required compaction. Avoid material segregation. Aggregate base must be free from pockets of coarse or fine material.
2. If the subgrade is cohesionless sand, you may dump aggregate base in piles and spread it ahead in sufficient quantities to stabilize the subgrade, if authorized.
3. If the aggregate base thickness shown is 0.50 foot or less, spread and compact the aggregate base in at least 1 layer. If the thickness shown is more than 0.50 foot, spread and compact

the aggregate base in at least 2 approximately equal layers in thickness. The compacted thickness of any one layer must not exceed 0.50 foot.

4. At locations inaccessible to spreading equipment, spread and compact aggregate base by any means that will attain the specified requirements.

B. Compacting

1. Compact each aggregate base layer to at least 95 percent relative compaction.
2. If biaxial geogrid is shown, compact aggregate base with either (1) a smooth-wheeled roller or (2) a rubber-tired roller. Do not use vibratory devices during compaction.
3. The finished aggregate base surface must not vary more than 0.05 foot from the grade established by the Engineer.

C. Spreading and compacting shall be performed by methods that will produce a uniform base, firmly and properly compacted to not less than ninety-five percent (95%) relative compaction, and free from pockets of course or fine material. All compacted materials may be tested by the County.

3.4 DISPOSAL

A. Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the Owner.

END OF SECTION – 321100

SECTION 321216

ASPHALT PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Hot Mix Asphalt

B. Tack coat

C. Hot Mix Asphalt paving

D. Hot Mix Asphalt overlay

E. Speed bumps

F. Asphalt curbs

G. Pavement grinding

H. Adjusting manholes, valves, monument covers and other structures to grade

1.2 RELATED SECTIONS

A. Division 1, General Requirements

B. Section 312000, Earthwork

C. Section 321100, Pavement Base Course

1.3 RELATED DOCUMENTS

A. Geotechnical Report: Geotechnical Investigation Reimagine Flood Park 215 Bay Road Menlo Park, California prepared by Cornerstone Earth Group dated June 27, 2022.

B. ASTM
1. D979: Standard Practice for Sampling Bituminous Paving Mixtures
2. D1188: Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
3. D2041: Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
4. D2726: Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
5. D2950: Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods

6. D3549: Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.

C. Caltrans Standard Specifications, 2015
1. Section 20: Landscape
2. Section 39: Asphalt Concrete
3. Section 88: Engineering Fabrics
4. Section 92: Asphalt Binder
5. Section 94: Asphaltic Emulsions
6. Section 96: Geosynthetics

1.4 DEFINITIONS

A. ASTM: American Society for Testing Materials.

B. Caltrans: State of California, Department of Transportation

1.5 QUALITY ASSURANCE

A. Testing Agency: Owner's Representative 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 hot mix asphalt: In-place compacted thickness of asphalt courses will be determined according to ASTM D3549.

D. Surface Smoothness: Finished surface of each asphalt course will be tested for compliance with smoothness tolerances.

E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D979.
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 D2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement may be determined by testing core samples according to ASTM D1188 or ASTM D2726.
    a. One core sample may be taken for every 1000 square yard or less of installed pavement, but in no case will fewer than 3 cores be taken.
    b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D2950 and correlated with ASTM D1188 or ASTM D2726.

1.6 SUBMITTALS

A. Follow submittal procedure outlined in Division 1, General Requirements.

B. Job-Mix Designs: Certificates signed by manufacturers certifying that each hot mix asphalt mix complies with requirements.

C. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

1.7 PROJECT CONDITIONS

A. Environmental Limitations:
1. Tack Coat: Minimum surface temperature of 60 F at application.
2. Asphalt Base Course: Minimum surface temperature of 40 F and rising at application.
3. Asphalt Surface Course: Minimum surface temperature of 60 F at application.
4. Reinforcing Fabric: Air temperature is 50 F and rising and pavement temperature is 40 F and rising.

PART 2 - PRODUCTS

2.1 HOT MIX ASPHALT

A. Type A In accordance with Caltrans Standard Specifications Section 39-2, Hot Mix Asphalt.

B. Hot Mix Asphalt Materials:
1. Asphalt Binder: Grade PG 64-10 in accordance with Caltrans Standard Specification Section 92, Asphalt Binders.
   a. The amount of asphalt binder to be mixed with the aggregate shall be between five percent (5%) and six percent (6%) by weight of dry aggregate. The exact amount of asphaltic binder to be mixed with the aggregate shall be as determined by the County appointed Construction Manager.
2. Tack Coat: Grade SS1 in accordance with Caltrans Standard Specification Section 94, Asphaltic Emulsions.

C. Aggregates: ½-inch max gradation for virgin aggregate and recycled asphalt pavement (RAP) in accordance with to Caltrans Standard Specification Section 39-2.02, Type A Hot Mix Asphalt.

D. Geosynthetic Pavement Interlayer: Paving Fabric in accordance with Caltrans Standard Specification Section 96, Geosynthetics.

E. Soil Sterilant: In accordance with Caltrans Standard Specifications Section 20-5.03, Inert Ground Covers and Mulches.

PART 3 - EXECUTION

3.1 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. If necessary, perform subgrade preparation or remediation in accordance with Section 312000, Earthwork.

D. Notify Owner in writing of any unsatisfactory conditions. Do not begin paving until these conditions have been satisfactorily corrected.

3.2 PAVEMENT GRINDING

A. Clean existing paving surface of loose or deleterious material immediately before pavement grinding.

B. Grind conforms as indicated.

3.3 PAVEMENT COLD PLANING

A. Existing asphalt concrete pavement shall be planed at all longitudinal and transverse conforms, as well as adjacent to concrete gutters, valley gutters and aprons, all in accordance with the Plans and as directed by the County appointed Construction Manager.

B. Generally, planing will be 6 feet wide longitudinally along the lip of gutter and edges of valley gutters and aprons, and 10 feet wide transversally at intersection/project limit conforms.

C. Planing of asphalt concrete pavement shall be performed by cold planing. Cold planing machine shall have a cutter head at least 30 inches wide and shall be operated as not to produce fumes or air pollution.

D. The depth, width and shape of the cut shall conform to the Plans and as directed by the County appointed Construction Manager. The Contractor is advised that more than one pass may be necessary to develop the specified depth and width. The final planing cut shall result in a uniformly rough surface.

E. Planed cut lines at conforms to existing asphalt concrete and Portland cement concrete to remain shall be neat and uniform, and shall be straight and the edges vertical to the depth specified. Planing shall be contiguous to Portland cement concrete.

F. The Contractor may propose an alternative method to planing, provided that the Contractor’s alternative method produces the desired result. The alternative method is subject to the County appointed Construction Manager’s approval.

G. The Contractor shall provide temporary 3-foot wide ramps, of cutback or other approved material, at all planed joints for transverse conforms, and at cross-streets and driveways, as well as at any other locations designated by the County appointed Construction Manager, unless otherwise directed by the County appointed Construction Manager.

1. The Contractor is reminded of the importance of public safety and the need to install the temporary cutback ramps the same day planing of asphalt concrete pavement occurs. The Contractor is advised that Contractor may incur task-specific liquidated damages in the amount of $2,000 per calendar day for every day hence until either temporary cutback ramps are installed or final pavement is completed.

3.4 PAVEMENT SAWCUT

A. Existing asphalt concrete and Portland cement concrete shall be sawcut at roadway, driveway, and shoulder conforms, and where existing concrete is to be removed to facilitate construction of sidewalk access ramps, curb and gutter, sidewalk, valley gutter, aprons, and at other locations shown on the Plans or directed by the County appointed Construction Manager. The exact limits shall be as shown on the Plans, unless prior written approval for adjustment is given by the County appointed Construction Manager. The Contractor shall provide a neat, clean, and uniform joint at all conforms, as directed by the County appointed Construction Manager.

B. All sawcutting operations shall be performed with a power-driven saw and the sawcut shall extend completely through the asphalt concrete and Portland cement concrete (or other facilities). The use of pavement breakers or other devices for cutting pavement will not be permitted unless specifically authorized, in writing, by the County appointed Construction Manager.

C. Cracked or broken pavement caused by, or new or existing improvements damaged by, the Contractor's operations shall be removed to a line established by the County appointed Construction Manager, and shall be replaced with new asphalt concrete or Portland cement concrete, all at the Contractor's expense and as directed by the County appointed Construction Manager, and no additional compensation will be allowed therefore.

3.5 SOIL STERILANT

A. Furnish and apply to areas per manufacturer’s specifications.

3.6 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 in accordance with Section 321100, Pavement Base Course.

B. Tack Coat: Apply uniformly and at specified rates between HMA layers, to vertical surfaces of curbs, gutters and construction joints, and to existing pavement, including planed surfaces, in accordance with the following guidelines:

1. Before placing HMA, apply a tack coat in 1 application at the minimum residual rate shown in the following table for the condition of the underlying surface:

Tack Coat (SS1 Asphaltic Emulsion) Application Rates for HMA

HMA Over	Minimum Residual Rates (gal/sq yd)
New HMA (between layers)	0.02
Concrete pavement and existing asphalt concrete surfacing	0.03
Planed pavement	0.05

2. Notify the Engineer if the asphaltic emulsion is diluted with water. The weight ratio of added water to asphaltic emulsion must not exceed 1 to 1.
   a. Measure added water either by weight or volume or use water meters from water districts, cities, or counties. If water is measured by volume, apply a conversion factor to determine the correct weight. With each dilution, submit:
      1) Weight ratio of water to bituminous material in the original asphaltic emulsion
      2) Weight of asphaltic emulsion before diluting
      3) Weight of added water
      4) Final dilution weight ratio of water to asphaltic emulsion
3. Apply a tack coat to vertical surfaces with a residual rate that will thoroughly coat the vertical face without running off.
4. If authorized, the following may be permitted:
   a. Change tack coat rates
   b. Omit tack coat between layers of new HMA during the same work shift if no dust, dirt, or extraneous material is present and the surface is at least 140 degrees F.
5. Immediately in advance of placing HMA, apply additional tack coat to damaged areas or where loose or extraneous material is removed.
6. Allow tack coat to cure undisturbed before paving.
7. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
8. The areas to which asphaltic emulsion has been applied shall be closed to public traffic, as specified and directed by the County appointed Construction Manager; and the Contractor shall avoid tracking asphaltic emulsion onto existing pavement surfaces beyond the limits of construction.
9. The Contractor will be responsible for any asphaltic emulsion stains. Such stains will be cleaned by sandblasting or any other method satisfactory to the County appointed Construction manager.

3.7 SURFACE PREPARATION FOR PAVEMENT AT HOT MIX ASPHALT OVERLAYS

A. Pavement Irregularities: Level with hot mix asphalt, Type A, ½ inch max aggregate.

B. Pavement Cracks:
   1. Less than ¼ inch wide: Clean of all dirt by compressed air jet, spray and seal with RS-1 asphaltic emulsion.
   2. Wider than ¼ inch: Clean of all dirt by compressed air jet, spray and seal with RS-1 asphaltic emulsion and skin patch.

C. Clean surface of all material, such as leaves, dirt, sand, gravel, water and vegetation prior to applying binder of paving asphalt to existing surface.

3.8 GEOSYNTHETIC PAVEMENT INTERLAYER

A. Where shown, place geosynthetic pavement interlayer over a coat of asphalt binder and in compliance with the manufacturer's instructions. Do not place the interlayer on a wet or frozen surface.

B. Before placing the interlayer and asphalt binder:
   1. Repair cracks ¼ inch and wider, spalls, and holes in the pavement. Repairing cracks is change order work.
   2. Clean the pavement of loose and extraneous material.

C. Immediately before placing the interlayer, apply 0.25 ± 0.03 gal of asphaltic binder per square yard of interlayer or until saturated. Apply asphalt binder the width of the interlayer plus 3 inches on each side. At an interlayer overlap, apply asphalt binder on the lower interlayer the same overlap distance as the upper interlayer.

D. Align and place the interlayer with no overlapping wrinkles, except a wrinkle that overlaps may remain if it is less than ½ inch thick. If the overlapping wrinkle is more than ½ inch thick, cut the wrinkle out and overlap the interlayer no more than 2 inches.

E. Overlap the interlayer borders between 2 to 4 inches. In the direction of paving, overlap the following roll with the preceding roll at any break. Rolling equipment may be used to correct distortions or wrinkles in the interlayer.

F. If asphalt binder tracked onto the interlayer or brought to the surface by construction equipment causes interlayer displacement, cover it with a small quantity of HMA.

G. Before placing HMA on the interlayer, do not expose the interlayer to:
   1. Traffic except for crossings under traffic control and only after a small quantity of HMA is placed
   2. Sharp turns from construction equipment
   3. Damaging elements

H. Pave HMA on the interlayer during the same work shift. The minimum HMA thickness over the interlayer must be 0.12 food thick including at conform tapers.

3.9 HOT MIX ASPHALT SPREADING AND COMPACTING EQUIPMENT

A. Paving equipment for spreading must be:
   1. Self-propelled
   2. Mechanical
   3. Equipped with a screed or strike-off assembly that can distribute HMA the full width of a traffic lane
   4. Equipped with a full-width compacting device
   5. Equipped with automatic screed controls and sensing devices that control the thickness, longitudinal grade, and transverse screed slope

B. Install and maintain grade and slope references.

C. The screed must be heated and produce a uniform HMA surface texture without tearing, shoving, or gouging.

D. The paver must not leave marks such as ridges and indentations unless you can eliminate them by rolling.

E. Rollers must be equipped with a system that prevents HMA from sticking to the wheels. A parting agent that does not damage the HMA or impede the bonding of layers may be used.

F. In areas inaccessible to spreading and compacting equipment:
1. Spread the HMA by any means to obtain the specified lines, grades, and cross sections
2. Use a pneumatic tamper, plate compactor, or equivalent to achieve thorough compaction

G. Material transfer vehicle
1. If a material transfer vehicle is specified, the material transfer vehicle must have sufficient capacity to prevent stopping the paver and must be capable of:
   a. Either receiving HMA directly from trucks or using a windrow pickup head to load it from a windrow deposited on the roadway surface
   b. Remixing the HMA with augers before transferring into the paver's receiving hopper or feed system
   c. Transferring HMA directly into the paver's receiving hopper or feed system

H. Method compaction equipment
1. For method compaction, each paver spreading HMA must be followed by 3 rollers:
   a. One vibratory roller specifically designed to compact HMA. The roller must be capable of at least 2,500 vibrations per minute and must be equipped with amplitude and frequency controls. The roller's gross static weight must be at least 7.5 tons.
   b. One oscillating-type pneumatic-tired roller at least 4 feet wide. Pneumatic tires must be of equal size, diameter, type, and ply. The tires must be inflated to 60 psi minimum and maintained so that the air pressure does not vary more than 5 psi.
   c. One steel-tired, 2-axle tandem roller. The roller's gross static weight must be at least 7.5 tons.
2. Each roller must have a separate operator. Rollers must be self-propelled and reversible.

3.10 HOT MIX ASPHALT PLACEMENT

A. Place, spread and compact hot mix asphalt to required grade, cross section, and thickness in accordance with these specifications.

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.

C. At road conforms and driveway openings designated by the County appointed Construction Manager, additional asphalt concrete surfacing material shall be placed and hand raked, if necessary, and compacted to form smooth tapered connections.

D. It shall be the Contractor's responsibility to ensure that the existing drainage patterns are maintained at all locations, as indicated on the Plans or as directed by the County appointed Construction Manager.

E. The Contractor will be responsibility for any damage to existing curbs, gutters, sidewalks and driveways. Any stains shall be cleaned by sandblasting or any other method satisfactory to the County appointed Construction Manager.

F. Any miscellaneous asphalt concrete placed beyond the limits, as shown on the Plans or as directed by the County appointed Construction Manager, and resulting from the Contractor's operations, shall be at the Contractor's expense, and no additional compensation will be allowed therefore.

3.11 JOINTS

A. Construct joints to ensure continuous bond between adjoining paving sections in accordance with the following guidelines:
   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. Longitudinal joints in the top layer must match lane lines. 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 hot mix asphalt will bear roller weight without excessive displacement.
   6. Vertical longitudinal joints of more than 0.15 foot is not allowed at any time between adjacent lanes open to traffic.
   7. For an HMA thickness of:
      a. 0.15 foot or less, the distance between the ends of the adjacent surfaced lanes at the end of each day's work must not be greater than can be completed in the following day of normal paving.
      b. Greater than 0.15 foot, HMA shall be placed on adjacent traveled way lanes or shoulder such that at the end of each work shift the distance between the ends of HMA layers on adjacent lanes is from 5 to 10 feet. Place additional HMA along the transverse edge at each lane's end and along the exposed longitudinal edges between adjacent lanes. Hand rake and compact the additional HMA to form temporary conforms. Kraft paper or other authorized release agents may be placed under the conform tapers to facilitate the taper removal when paving activities resume.
   8. If placing HMA against the edge of existing pavement, sawcut or grind the pavement straight and vertical along the joint and remove extraneous material.

3.12 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact in accordance with Section 3.7.

B. Compaction Requirements: Compacting shall be performed to achieve not less than ninety-five percent (95%) of the maximum theoretical density. Acceptance testing shall be performed using California Test Method (CT) 375, as directed by the County appointed Construction

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.

3.13 ~~SMOOTHNESS CORRECTIONS~~

A. ~~For areas that require pavement smoothness determined using an inertial profiler, the pavement surface must:~~
1. ~~Have no areas of localized roughness with an International Roughness Index greater than 160 in/mi~~
2. ~~Comply with the Mean Roughness Index requirements shown in the following table for a 0.1-mile section:~~

~~HMA Pavement Smoothness Acceptance Criteria~~

~~HMA Thickness~~	~~Mean Roughness Index Requirement~~
~~> 0.20 foot~~	~~60 in/mi or less~~
~~≤ 0.20 foot~~	~~75 in/mi or less~~

~~Note: These requirements do not apply to the open graded friction course (OGFC) surface.~~

B. ~~The final surface of HMA must comply with the Mean Roughness Index requirements before placing open graded friction courses (OGFC). Correct pavement to the Mean Roughness Index specifications. Areas of localized roughness greater than 160 in/mi must be corrected regardless of the Mean Roughness Index values of a 0.1-mile section.~~

C. ~~Should the newly paved surface fail to comply with parts A & B, the Contractor shall, at the Contractor's own expense, perform corrective measures including grinding the pavement to within specified tolerances, removing and replacing the pavement, or placing an overlay of HMA. Do not start corrective work until the method is authorized. Such corrective measures shall be approved by the County appointed Construction Manager. Failure to obtain County approval of proposed corrective measures may result in additional corrective measures, all at the Contractor's sole expense, and no additional compensation will be allowed therefore.~~

D. ~~Do not use equipment with carbide cutting teeth to grind the pavement unless authorized.~~

E. ~~Smoothness corrections must have at least 75 percent of the specified HMA thickness. If ordered, core the pavement at the locations selected by the Engineer. Coring, including traffic control, is change order work. Remove and replace deficient pavement areas where the overlay thickness is less than 75 percent of the thickness specified.~~

F. ~~Corrected HMA pavement areas must be uniform rectangles with edges:~~
1. ~~Parallel to the nearest HMA pavement edge or lane line~~
2. ~~Perpendicular to the pavement centerline~~

G. ~~On ground areas not to be overlaid with OGFC, apply a fog seal coat.~~

H. ~~Where corrections are made within areas requiring testing with inertial profiler, reprofile the entire lane length with the inertial profiler.~~

I. ~~Where corrections are made within areas requiring testing with a 12-foot straightedge, retest the corrected area with the straightedge.~~

J. ~~Following any initial corrective measures, the County appointed Construction Manager will again make a determination as to roadway smoothness.~~

3.14 SPEED BUMPS

A. Construct speed bumps over compacted pavement surfaces in accordance with requirements outlined in these specifications. Apply a light tack coat prior to construction, unless pavement surface is still tacky and free of dust.

B. Place asphalt concrete by hand using a template/screed designed to result in speed bump cross-section indicated after compaction.

C. Compact speed bumps with 8 ton static roller.

3.15 ADJUSTING MANHOLES, VALVES, MONUMENT COVERS AND OTHER STRUCTURES TO GRADE

A. Remove pavement, using vertical cuts, as needed to remove frame and provide for concrete collar. Do not damage adjacent pavement.
   1. Circular Covers: Cut circle with radius 6 inches larger than cover and concentric with cover.
   2. Rectangular Covers: Cut rectangle 6 inches larger than cover on all sides.

B. Install grade rings or blocking as needed to raise cover to finish grade.

C. Pour concrete collar:
   1. Bottom of Collar: Top of existing collar or 6 inches below top of proposed collar, whichever is at a higher elevation.
   2. Top of Collar: Bottom of existing asphalt pavement.
   3. Apply tack coat to all exposed surfaces.
   4. Fill excavation with hot mix asphalt and, while still hot, compact flush with adjacent surface.

3.16 INSTALLATION TOLERANCES

A. Hot Mix Asphalt Pavement:
   1. Course thickness and surface smoothness shall be in accordance with Section 3.11.
   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 – 321216

SECTION 321216.13

FOG SEAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The Contractor shall perform all work associated with Fog Seal as shown and as specified herein including all labor, materials, equipment supplies, and facilities associated with providing a finished product satisfying all the requirements of the Contract Documents.

1.2 CONTRACTOR SUBMITTALS

A. The Contractor shall submit, at least seven (7) working days before fog seal placement commences, a laboratory report of test results and proposed mix design covering the specific materials to be used on the project. The percentage of asphaltic emulsion proposed in the mix design shall be within the percentage range specified herein.

1.3 RELATED DOCUMENTS

A. Caltrans Standard Specifications, 2015
   1. Section 37: Bituminous Seal

PART 2 - PRODUCTS

2.1 FOG SEAL

A. Fog seal shall be in accordance with Section 37-4 of the Caltrans Standard Specifications with the exceptions noted in these specifications.

2.2 ASPHALTIC EMULSION

A. Asphaltic emulsion shall be in accordance with Section 37 (Bituminous Seal) and Section 94 (Asphaltic Emulsions) of the Caltrans Standard Specifications with the exceptions noted in these specifications.

B. Asphaltic emulsion for pavement repair areas shall be Type SS1.

2.3 WATER AND ADDITIVE

A. Water shall be of such quality that the asphalt will not separate from the emulsion before the fog seal is in place in the work. If necessary for workability, a set-control agent that will not adversely affect the fog seal may be used.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. The application of fog seal shall conform to the following guidelines:
   1. Dilution rate must not be more than 50 percent water or 1:1 ratio.
   2. Diluted emulsion must be applied with a residual asphalt rate of 0.03 gal/sq yd.
   3. If the fog seal becomes tacky, sprinkle water as required.
   4. The Contractor shall sweep all fog seal pavements two (2) days after the application of fog seal with a power sweeper.

3.2 MIXING AND SPREADING EQUIPMENT

A. General
   1. Mixing and spreading equipment for fog seal must proportion asphaltic emulsion, water, and any set-control additives by volume and mix them in continuous pugmill mixers. Continuous pugmill mixers must be of adequate size and power for the type of materials to be mixed.

B. Continuous Self-Loading Mixing Machine
   1. Continuous self-loading mixing machines must be automatically sequenced and self-propelled. The mixing machine must deliver each material to a double shafted mixer and discharge the mixed material on a continuous flow basis. The mixing machine must have sufficient storage capacity to maintain a continuous supply of material to the proportioning controls. The mixing machine operator must have full control of forward and reverse speeds during placement.

C. Fog Seal Equipment
   1. General
      a. Introduce emulsion into the mixer with a positive displacement pump. If you use a variable-rate pump, the adjusting unit must be sealed in its calibrated position.
      b. Introduce water into the mixer with a meter that measures gallons.
      c. Identifying numbers for equipment must be at least 2 inches high and located on the front and rear of the vehicle.
   2. Spreader Box: The spreader box used to spread the mixture must be:
      a. Capable of spreading an entire walk width.
      b. Equipped with flexible rubber belting on each side. The belting must contact the pavement to prevent loss of slurry from the box.
      c. If wider than 7.5 feet, equipped with baffles, reversible motor-driven augers, or equivalent features to uniformly apply the fog seal on superelevated sections and shoulder slopes.

d. Equipped with rear flexible strike-off blades in close contact with the pavement and adjustable to various crown shapes to uniformly apply the fog seal.
e. Equipped with flexible drags attached to the rear and cleaned daily and changed if longitudinal scouring occurs.
f. Clean and free of fog seal or emulsion at the start of each work shift.

3. The spreader box shall be clean and free of all fog seal and emulsion at the start of each working shift.

3.3 SAND BLOTTER

A. A sand blotter shall be spread at selected driveways, intersections, and where required by the County appointed Construction Manager to accommodate pedestrian or vehicular traffic until the slurry set.

3.4 SURFACE PREPARATION

A. Before application of fog seal, the pavement surface shall be cleaned by removing loose particles of extraneous materials, including paving and dirt by sweeping with pickup broom/mobile type sweepers with water spray bars to reduce dust. The County appointed Construction Manager shall approve of the type of sweeper to be used. If necessary, more than one sweeper shall be used. Sidewinder sweepers or brooms that windrow material and do not remove it shall not be used. Completion of sweeping shall be evidenced by the absence of all loose particles of paving, dirt and other extraneous material, on the roadway, in the gutters, and other affected areas. If needed, all areas shall be swept a second time or more if necessary in the same manner or as directed by the County appointed Construction Manager prior to placing the fog seal.

B. All material gathered shall be properly disposed of by the Contractor. The Contractor shall remove all plant material growing in the asphalt surface prior to placing slurry.

C. Immediately preceding the fog seal application, the Contractor shall cover all grates, slotted manholes, and other appurtenances on the pavement that would allow the entry of slurry; cover all manhole covers, water and gas valve box covers, monuments boxes, grates and other exposed facilitates with plastic oil resistant construction paper secured by tape or adhesive. The Contractor prior to the final set of the slurry shall uncover all covered manholes, valves, grates and boxes. All uncovered items shall be clean and meet the requirement of the County appointed Construction Manager.

D. All catch basin grates and hoods adjacent to the work or within 50 feet shall be covered to prevent slurry from entering the catch basin.

E. If fog seal activities affect access to public parking, residential property, or commercial property, notify residents, businesses, and local agencies at least 24 hours before starting activities. The notice must:
1. Describe the work to be performed
2. Detail streets and limits of activities
3. Indicate work hours
4. Be authorized

F. Before starting fog seal activities, post signs at 100-foot intervals on the affected streets. Signs must display *No Parking – Tow Away*. Signs must state the day of the week and hours parking or access will be restricted.

G. Within 1 hour after placement, fog seal must be set enough to allow pedestrian traffic. Fog seal must be exhibit distress from traffic such as bleeding, raveling, separation or other distresses.

3.5 APPLICATION

A. General
   1. Longitudinal and transverse joints must be:
      a. Uniform
      b. Straight
      c. Neat in appearance
      d. Butt-type joints
      e. Without material buildup
      f. Without uncovered areas
   2. Place longitudinal joints:
      a. On edge lines
      b. With overlaps not more than 3 inches
   3. Set the leading edge of kraft paper on transverse joints to create a straight butt joint with the next application when the paper is removed.
   4. Weigh or gallonage tags shall be furnished to the County appointed Construction Manager by the Contractor for all materials delivered to the Project for fog seal, including asphaltic emulsion.

B. The surface shall be fogged with water directly preceding the spreader. The slurry mixture shall be of the desired consistency when deposited on the surface. Total time of mixing shall not exceed four (4) minutes. A sufficient amount of slurry shall be carried in all parts of the spreader at all times so that the complete coverage is obtained. No excessive breaking of the emulsion will be allowed in the spread box. No streaks will be left in the finished pavement.

C. Spread fog seal in full walk widths.

D. Use kraft paper at transverse joints and over previously placed fog seal to prevent double placement. Remove the paper after use. Use hand tools to remove spillage.

E. The finished surface must be smooth. No excessive buildup, or unsightly appearance shall be permitted on longitudinal or transverse joints. Burlap drags shall be used and changed daily.

F. The mixture must be uniform and homogenous after spreading.

G. Approved squeegees shall be used to spread slurry in non-accessible areas to the slurry mixer. Care shall be exercised in leaving no unsightly appearance from handwork.

H. Slurry application will be stopped to allow sufficient time to allow slurry to cure prior to opening walk to foot traffic. Protect the fog seal from damage until it has cured.

I. All pavement shall be swept by the Contractor two days after completion of the fog seal. The Contractor shall perform additional sweeping after placement of the fog seal to ensure that any loose rock is removed, at the direction of the County appointed Construction Manager.

J. The Contractor shall conform fog sealed to the existing manholes, gas and water valves, monuments, concrete valley gutters and concrete curbs and gutters, as directed by the County appointed Construction Manager in the field. Hydrant markers shall be cleaned as directed by the County appointed Construction Manager at the Contractor's expense. Fog seal that is overlapped on manholes, gas and water valves, monuments, concrete valley gutters and concrete curbs and gutters shall be cleaned, as directed by the County appointed Construction Manager, at the expense of the Contractor, and no additional compensation will be allowed therefore.

3.6 WEATHER LIMITATIONS

A. The fog seal shall not be applied when either atmospheric or pavement temperature is 50 degrees Fahrenheit and falling but may be applied when either the atmospheric or pavement temperature is above 50 degrees Fahrenheit and rising. The fog seal shall not be applied during periods of abnormally high relative humidity. Do not place a fog seal within 24 hours of rain or within 24 hours of forecast rain or freezing temperatures.

3.7 FOG SEAL REPAIR

A. In the event that the applied fog seal surface violates the project requirements or has the following conditions:
   1. Tire or wheel marks
   2. Longitudinal ridges
   3. Picked up or raveled areas
   4. Transverse ridges or bumps
   5. Washboarding or excessively rough sand blotters

B. The fog seal shall be repaired as follows:
   1. The fog seal shall be removed by a "PENHALL PROFILER" or equal and a full walk width pass of fog seal applied in full compliance with these specifications.
   2. The Engineer may omit removal of the affected fog seal if it would not affect the repair.

C. The Contractor shall be responsible for any damage or stains to the existing striping and pavement markers, curbs and gutters, and roadways and driveways that occur during the course of this Contract. Stains will be cleaned by sandblasting, or any other method satisfactory to the County appointed Construction Manager. Damage or stains caused by the Contractor's operations shall be repaired or replaced by the Contractor at his expense and to the satisfaction of the County appointed Construction Manager, and no additional compensation will be allowed therefore.

END OF SECTION – 321216.13

SECTION 321243

POROUS ASPHALT CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes:

1. Porous Asphalt Pavement
2. Pavement Base
3. Geotextile for Soil Separation

1.2 STANDARDS AND CODES

A. Reference Standards: This section incorporates by reference the latest revisions of the following documents. These references are a part of this section as specified and modified.

Reference	Title
Caltrans	Standard Specifications (published by State of California Business, Transportation, and Housing Agency, Department of Transportation)
AASHTO	Standards of the American Association of State Highway and Transportation Officials, 1998 or latest edition
ASTM	Annual Book of ASTM Standards, American Society for Testing and Materials, Philadelphia, PA, 1997 or latest edition.
NAPA IS 115	Design, Construction, and Maintenance of Open-Graded Asphalt Friction Courses
NAPA IS 131	Porous Asphalt Pavements for Stormwater Management, Design, Construction, and Maintenance.

1. Caltrans Standard Specifications: Any references to Caltrans Standard Specifications invoke technical specifications in Section 39 for material, construction, and quality control and quality assurance only. Caltrans contractual requirements, general specifications, and measurement and payment do not apply.
2. Caltrans Standard Specifications Term Equivalencies

Terms Equivalencies	
Term or Clause in Caltrans Standard Specifications	**Term or Clause in These Specifications**
The Department	The Owner / The County
OGFC	Porous Asphalt

1.3 REFERENCES

A. Draft Geotechnical Investigation, Reimagine Flood Park, by Cornerstone Earth Group, dated June 27, 2022.

1.4 SUBMITTALS

A. Bid Submittals: The Contractor shall submit to the County the following as part of the bid proposal:
   1. Project experience and personnel qualification examples as specified in Section 1.5.B for the contractor and personnel assigned to this project. Refer to Division 1 Specifications for additional requirements.

B. Pre-Installation Submittals: Submittals shall conform to the requirements of Caltrans Standard Specifications including:

   1. Proposed job mix formula per Section 1.5.B of this Specification.
   2. Proposed QC plan. The QC Plan shall satisfactorily test the porous asphalt for compliance with Section 1.5.D of these Special Provisions, with the following modifications and additions:
      a. In addition to the submittal requirements, the Contractor shall submit the following:
         1) Source certificates, gradations, R-values, LA abrasion, and cleanness values of aggregates for base and reservoir course materials performed within one (1) month of product delivery to site.
         2) Product data sheets for geotextiles.
         3) Testing agency qualifications as specified in Section 1.5.A.

1.5 QUALITY CONTROL AND QUALITY ASSURANCE

A. General: Test and inspect asphalt materials and operations as Work progresses as described in this section. Failure to detect defective Work or materials at any time will not prevent rejection if a defect is discovered later, nor shall it constitute final acceptance.

   1. Contractor and Personnel Qualifications
      a. Contractor qualification: The Contractor shall provide documentation showing one of the following for the general contractor or paving subcontractor:
         1) One (1) example owner-accepted porous asphalt project, similar (or greater) in extent to the proposed project, completed in the last one (1) year with reference.
            OR
         2) Three (3) example owner-accepted open graded friction course projects completed in the last one (1) year with references.
         3) Documentation shall include name and address of project, and contact information for project owner.
      b. Personnel qualification: The Contractor or paving subcontractor shall provide a qualified foreman with experience installing porous asphalt and documentation showing with following:
         1) One (1) example owner-accepted porous asphalt project, similar (or greater) in extent to the proposed project, completed in the last one (1) year with reference.

2) Documentation shall include name and address of project, and contact information for project owner.
3) The qualified foreman shall be onsite for the duration of asphalt work including preparation, placement, testing, and completion.

c. Testing agency qualification: Agencies that perform testing on porous asphalt materials shall meet the requirements of Caltrans Standard Specification Section 39 or be accredited by the AASHTO Accreditation Program (AAP) for the scope and standard being evaluated.
d. Plant qualification: Batch or continuous mixing plants used for porous asphalt shall meet the requirements of Caltrans Standard Specification Section 39.

B. Authorized Job Mix Formula (JMF): The mix design process shall conform to Caltrans Standard Specification Section 39-2.02A except as noted below.

1. The products used in the JMF shall meet the requirements in Section 2.01 of this Specification.
2. The JMF shall meet the quality characteristics defined in Section 39-2.02B with the modified and additional quality characteristics listed in the table below.
3. Once verified and accepted by the Engineer, the JMF meeting the criteria above shall become the Authorized JMF. Any adjustments or renewals of the JMF shall be per Caltrans Standard Specifications Section 39-2.02 (Hot Mix Asphalt Mix Design Requirements). Submit a letter from the asphalt supplier with the recommended temperature ranges for mixing, laying, breakdown rolling, and finished rolling, as well as the recommended maximum temperature of the finished mat before placement of subsequent lifts.

C. Responsibilities of Contractor

1. General: Conform to the requirements set forth in Section 39 of the Caltrans Standard Specifications.
2. Pre-Placement Conference: A mandatory pre-placement conference will take place, including at a minimum the County appointed Construction Manager, the Owner, the general Contractor, and paving subcontractor, to review preparation, placement, testing procedures, and responsibilities.
3. Quality Control: Contractor quality control inspection and testing of porous asphalt shall be conducted in accordance with the approved QC plan.
4. Load Slip: Provide a load slip certified by a licensed weightmaster showing combined mixture weight for each load of porous asphalt transported to the location.
5. Infiltration Rate Testing: Perform surface infiltration tests per ASTM C1701 as described below.
    a. Three (3) test locations per 10,000 square feet of porous asphalt in place.
    b. One (1) additional test location per 5,000 square feet of porous asphalt, or fraction thereof, in place.
6. Required Inspections: Notify the County appointed Construction Manager at least 5 business days prior placement of porous asphalt.
7. Failed Tests: Each test shall meet the acceptance criteria as defined in this section. For any single quality characteristic except smoothness, if two consecutive quality control test results do not comply with the action limits or specifications:
    a. Stop production.
    b. Notify the County appointed Construction Manager.
    c. Take corrective action.

d. Demonstrate compliance with the specifications before resuming production and placement.

D. Acceptance: Acceptance of porous asphalt shall be determined based on the criteria defined in Section 39-2.04A (Quality Assurance) of the Caltrans Standard Specifications, with the following modifications and additions:

1. Source aggregate will not be subject to acceptance testing once is has been approved as part of the JMF, unless samples are requested by the County approved Construction Manager.
2. Retained Tensile Strength: Retained tensile strength shall be tested in accordance with AASHTO 283.

Test results for air voids, draindown, and retained tensile strength shall be consistent with the characteristics of the approved JMF.

3. Infiltration Testing
   a. Infiltration Visual Testing: Visual flood testing of the surface shall be conducted by application of clean water at the rate of at least 5 gpm over the surface, using a hose or other distribution devise. Water used for the test shall be clean, free of suspended solids and deleterious liquids and will be provided at no extra cost to the Owner. All applied water shall infiltrate directly without large puddle formation or surface runoff, and shall be observed by the Engineer. The Engineer shall mark areas where large puddles form in the field. Areas with slow infiltration shall not exceed 10 percent of the total surface.
4. Smoothness: Porous asphalt smoothness shall be checked with a 10-foot straightedge. Vertical measurement shall be taken between the pavement's determined plane and straight edge in a direction perpendicular and parallel to conform line. The finished pavement shall be uniform to a degree such that no variations greater than 3/8-inch are present between the straightedge and pavement surface.
5. Grade: Porous asphalt shall be true to designed spot elevations plus or minus ½ inch and shall not deviate from designed slope more than ¼ inch in ten (10) feet. Where abutting existing facilities such as sidewalks, walkways, curbs, driveways or other pavements, the porous asphalt shall be flush.
6. Line: Porous asphalt margins shall be true to designed lines plus or minus ½ inch at any point.
7. Slope: Porous asphalt shall be sloped as shown on the Plans. Slope shall be consistent to within 1/4 inch in ten (10) feet.
8. Thickness: Each core sample shall be equal to the minimum section depth or more as specified on the Plans.
9. Load Slip: Each load of porous asphalt transported to the location of placement shall have a load slip delivered with the load that is certified by a licensed weightmaster and includes the combined mixture weight.
10. Reduced Payment Factors: The reduced payment factors in Caltrans Standard Specification 39-2.03A (Testing) do not apply.

PART 2 - PRODUCTS

2.1 POROUS ASPHALT

A. Asphalt Binder: Asphalt binder must comply with Caltrans Specification Section 39-2.04B(3).

B. Aggregates: Aggregates shall conform to Caltrans Specification Section 39-2.04B(4) for Open Graded Friction Course (OGFC).

C. Materials Not to Be Used: The following materials shall not be used unless approved in advance by the Engineer.

1. Tack Coat (except on vertical faces of curbs, edges of PCC structures, or when paving over areas with impermeable bases).
2. Asphalt Rubber Binder.
3. Crumb Rubber Modifier.
4. Reclaimed Asphalt Pavement.
5. Paint Binder

D. Job Mix Formula (JMF): The JMF shall comply with the requirements of Section 1.5.C of this Specification.

2.2 PAVEMENT BASE

A. Pavement Base Material shall consist of clean, mechanically crushed stone, substantially free from adherent coatings. Materials shall be washed thoroughly to remove clay, organic matter, extraneous debris, or objectionable materials. Recycled materials are not permitted. The Material shall be obtained only from a source(s) approved by the Geotechnical Engineer or County approved Construction Manager. Written requests for source approval shall be submitted to the Geotechnical Engineer or County approved Construction Manager not less than 10 Working Days prior to the intended use of the Material. Should the proposed source be one that the Geotechnical Engineer or County approved Construction Manager has no history of Material performance with, the Geotechnical Engineer or County approved Construction Manager reserves the right to take preliminary samples at the proposed source, and make preliminary tests, to first determine acceptability of the new source and then perform the applicable Material approval testing. Continued approval of a source is contingent upon the Materials from that source continuing to meet Contract requirements. Materials shall meet the Standard Specifications for grading and quality for use in the Work; however, allowable exceptions may be specified in the Contract. The Geotechnical Engineer or County approved Construction Manager shall reserve the right to sample and test Material at any time including at the source.

B. Pavement Base shall consist of up to two (2) layers as specified on the Plans and included herein:

1. “Base Course” shall be asphalt-treated permeable base (ATPB) in accordance with Caltrans Section 29-2 “Asphalt Treated Permeable Base”.
2. “Reservoir Course” shall be open-graded crushed rock reservoir consist of ¾- to 1½-inch diameter clean crushed rock.

2.3 GEOTEXTILE FOR SOIL SEPARATION

A. Mirafi HP270 or approved equivalent.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION AND PROTECTION

A. Construct subgrade to +/- ¾ inch of the grades and slopes specified on the Plans.

B. Grading of subgrade shall be with low ground pressure equipment when within six (6) inches of final subgrade elevation.

C. Compact subgrade to 90 percent (+/- 2 percent) of the maximum dry density per standard Proctor test (ASTM D698), or as directed by the Geotechnical Engineer. Determination of in-place density shall be made using a nuclear gauge per ASTM D6939.

D. Areas of the subgrade which are over-compacted, as determined by the Geotechnical Engineer, shall be ripped/tilled to a depth of 12 inches (minimum) or as directed by the Geotechnical Engineer, and shall be recompacted in accordance with 3.1.C. Contractor shall locate all utilities within pavement footprint prior to ripping and re-compacting subgrade

E. Proof-roll prepared subgrade with loaded dump truck, remove soft spots, and replace with permeable structural fill as directed by the Geotechnical Engineer to achieve uniform subgrade.

F. After compaction and proof roll, scarify subgrade ¼ to ½ inch deep by hand rake. Once scarified, materials or equipment shall not be permitted within the prepared subgrade area so as to avoid recompaction or clogging of the scarified subgrade.

G. The subgrade shall be protected from over-compaction or contamination by silty run-off or other contaminants.

1. Provide physical barriers or direct traffic to eliminate unnecessary vehicular traffic on the subgrade during construction in accordance with the County ordinances and specifications.
2. Provide flow diversion and erosion control measures to protect the permeable pavement area from sedimentation until the upstream catchment area is thoroughly stabilized.

H. Areas of subgrade over-compacted by construction traffic or other impacts by the Contractor or Subcontractors shall be ripped/tilled and re-compacted in accordance with Section 3.1.D. All work and materials required to correct the over-compacted subgrade, including utility locates within the pavement footprint, shall be at the Contractor’s expense.

I. Areas of subgrade contaminated by the accumulation of silty material following rains or other debris or contamination shall be removed and disposed at the Contractor’s expense.

J. The subgrade shall be inspected and accepted by the Geotechnical Engineer prior to placement of the geotextile or pavement base.

K. Place Mirafi HP270 or approved equal on scarified subgrade and at least 12 inches up the sides of the excavation area. Geotextile fabric should be placed in accordance with manufacturer’s requirements and observed by a Geotechnical Engineer representative during construction prior to placing the sub-base layer. Care shall be taken to provide full coverage and to prevent the geotextile from being torn. Damaged geotextile shall be repaired as indicated by the manufacturer and to the satisfaction of the Engineer, at the Contractor’s expense. Overlaps of the geotextile shall be a minimum of 1 foot or to the manufacturer’s recommendation, whichever is greater.

L. Construct pavement base to the lines, grades, and thicknesses shown on the Plans.

M. Place the pavement base so as to prevent loaded dump trucks from driving directly on the prepared subgrade.

N. Compact pavement base, in six (6)-inch (maximum) lifts, by making a minimum of three passes over the pavement base material with a ten (10)-ton vibratory roller, or as directed by the Geotechnical Engineer. The first two (2) passes (minimum) shall be in vibratory mode. The final pass shall be in static mode. Acceptance of the pavement base will be based on Engineer's observation of aggregate movement during final compaction pass. Compaction equipment shall be accepted by the County approved Construction Manager prior to use.

For areas or sites that cannot accommodate a vibratory roller compactor, County approved Construction Manager may allow compaction of pavement base with a 13,500 lbf (60 kN) minimum vibratory plate compactor with a compaction indicator. At least two passes should be made over each lift of the aggregates.

O. Pavement base shall be true to the designed grade and slope, +/- 0.05 feet, after compaction for each layer. In the event of low spots additional material shall be added and recompacted. In the event of high spots, excess material shall be removed and the area recompacted.

P. The pavement base shall be protected from over-compaction or contamination by silty run-off or other contaminants.

1. Provide physical barriers or direct traffic to eliminate unnecessary vehicular traffic on the pavement base during construction.
2. Provide flow diversion and erosion control measures to protect the permeable pavement area from sedimentation until the upstream catchment area is thoroughly stabilized.

Q. Any damage to the pavement base (including contamination by silty run-off) shall be repaired to the satisfaction of the Engineer at the Contractor's expense. Contaminated pavement base shall be removed and replaced to the limits as determined by the Engineer.

R. The pavement base shall be inspected and accepted by the Geotechnical Engineer or County appointed Construction Manager prior to placing any porous asphalt.

3.2 POROUS ASPHALT PREPARATION

A. Preparation for placement of porous asphalt pavement shall comply with Section 321216, Asphalt Paving, except as noted below.

1. Pavement Base: Confirm that the completed pavement base conforms to these specifications.
2. Tack Coat: Shall be used on vertical faces of curbs, edges of PCC structures, or when paving over areas with impermeable bases.
3. Geosynthetic Pavement Interlay: Shall not be used.
4. Environmental Conditions: Do not place porous asphalt when the ambient temperature is less than 60 degrees Fahrenheit, on any wet surface, or when the average ground surface temperature is less than 45 degrees Fahrenheit.
5. Qualified Personnel: The qualified foreman as defined in 1.5.A.1 shall be onsite for the duration of porous asphalt preparation.

3.3 POROUS ASPHALT PLACEMENT

A. Porous asphalt equipment, transportation, spreading, and compacting shall comply with the Caltrans Specification applicable to Open Graded Friction Course (OGFC), except as noted below or as specified in the approved mix design.

B. Qualified Personnel: The qualified foreman as defined in 1.5.A.1 shall be onsite for the duration of porous asphalt placement.

C. Spreading and Compacting Equipment: Shall comply with Section 321216, Asphalt Paving, except that pneumatic tire rollers shall not be used.

D. Spreading and Compacting:

1. The type of rollers to be used and their relative position in the compaction sequence shall be dictated by the contractor provided the requirements below are met and the completed porous asphalt meets the required quality characteristics specified in Section 1.5. Deviation from the requirements below must be approved in advance by the County appointed Construction Manager.

    a. The porous asphalt shall be laid in lifts of up to 4 inches in thickness using approved equipment to achieve the total thickness indicated in the Plans.
    b. The temperature of the Porous HMA mix during laying, breakdown rolling, and finished rolling, shall be within the supplier-recommended temperature range.
    c. Breakdown rolling shall be performed with one or two passes of a 7.5- to 10-ton vibratory roller operated in low amplitude mode when the mix temperature is within the supplier-recommended temperature range.
    d. Finished rolling shall be performed with a double-drum finish roller operated in static mode when the mix temperature is within the supplier-recommended temperature range.
    e. Finished paving shall be even, without pockets, and graded to elevations shown on the Plans. Finished porous asphalt shall meet the acceptance criteria for Smoothness set forth in Section 1.5.D.
    f. The Contractor shall take care to ensure that the porous asphalt lifts join completely to previous lifts. The Contractor shall keep the time between lift placements to a minimum, keeping the surface of the previous lift clear from dust and moisture between lifts, and restrict traffic from initial lifts until the full depth of asphalt pavement has been placed.
    g. Sufficient time shall be allowed between lifts to allow the asphalt to set and cool to at or below the supplier recommended maximum temperature for placement of subsequent lifts.

3.4 OPENING TO TRAFFIC

A. After final rolling, no vehicular traffic of any kind shall be permitted on the pavement surface until cooling and hardening has taken place, and in no case within the first six (6) hours. Provide traffic control measures as necessary to prevent vehicular use and remove when no longer required.

3.5 PROTECTION OF PAVEMENT

A. Hardened porous asphalt pavement surface shall be kept clean and free of clogging debris and soils from the Contractor's operations and all upstream and adjacent debris. If debris or soils contaminate the porous pavement voids, the pavement shall be cleaned at the Contractor's expense and to the satisfaction of the County appointed Construction Manager. If porous asphalt pavement cannot be unclogged, it shall be removed and replaced at the Contractor's expense and to the satisfaction of the County appointed Construction Manager.

3.6 REJECTION

A. Porous asphalt that does not meet the acceptance criteria set forth in Section 1.05.D will be rejected by the County appointed Construction Manager. Porous asphalt that has been rejected by the County appointed Construction Manager shall be removed and replaced at the Contractor's expense.

END OF SECTION 321243

SECTION 321400

SLURRY SEAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The Contractor shall perform all work associated with Slurry Seal as shown and as specified herein including all labor, materials, equipment supplies, and facilities associated with providing a finished product satisfying all the requirements of the Contract Documents.

1.2 CONTRACTOR SUBMITTALS

A. The Contractor shall submit, at least seven (7) working days before slurry seal placement commences, a laboratory report of test results and proposed mix design covering the specific materials to be used on the project. The percentage of asphaltic emulsion proposed in the mix design shall be within the percentage range specified herein.

1.3 RELATED SECTIONS

A. Section 321723, Pavement Markings

1.4 RELATED DOCUMENTS

A. Caltrans Standard Specifications, 2015
   1. Section 37: Bituminous Seal

PART 2 - PRODUCTS

2.1 SLURRY SEAL

A. Slurry seal shall be Type II in accordance with Section 37-3 of the Caltrans Standard Specifications with the exceptions noted in these specifications.

2.2 AGGREGATE

A. Aggregate for Type II slurry seal shall be in accordance with Section 37-3.02A and 37-3.02B of the Caltrans Standard Specifications.

2.3 ASPHALTIC EMULSION

A. Asphaltic emulsion shall be Grade PMCQS-1h cationic, and shall conform to the following required specifications, or as directed by the County appointed Construction Manager.

Specifications for Asphaltic Emulsion PMCQS-1h

Test on Emulsion	Test Method	Typical Results	Specification	
			Min.	Max.
Viscocity @ 77˚F (25˚C) (SSF)	ASTM D244	22	15	100
Sieve Test, %	ASTM D244	0.1	-	0.01
Residue by Distillation, %	ASTM D244	61.5	57.0	
Particle Charge Test	ASTM D244	-	Positive	
Test on Residue from Distillation Test	Test Method	Typical Results	Specification	
			Min.	Max.
Penetration, @ 77˚F (25˚C), dmm	ASTM D5	52	15	90
Ductility, @ 77˚F (25˚C), dmm	ASTM D113	100+	40	-
Solubility in TCE, w%	ASTM D2042	99+	97.5	-

Notes:
(1) Torsional Recovery at 22%
(2) The bidder must supply a notarized certification from the polymer supplier, showing compliance with above, to the Engineer.

B. The polymer within the asphalt emulsion shall be Neoprene, SBR, EVA, or SBS or approved equal. Solid polymer such as EVA, SBS, or approved equal shall be adequately blended into the asphalt prior to the asphalt prior to emulsification. If latex such as Neoprene, SBR or similar is used, the latex shall be "co-milled" into the emulsion through the water phase during manufacturing. Each load of polymer asphaltic emulsion shall have a certificate from the asphalt emulsion manufacturing indicating that either asphalt blending or "co-milling" process is used. The certificate shall also state the percentage of the solid rubber polymer added, by weight of the asphalt, as well as the composition of the polymer. The addition of latex to the emulsion after emulsion manufacturing is prohibited.

2.4 WATER AND ADDITIVE

A. Water shall be of such quality that the asphalt will not separate from the emulsion before the slurry seal is in place in the work. If necessary for workability, a set-control agent that will not adversely affect the slurry seal may be used.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. The application of Type II slurry seal shall conform to the following guidelines:

1. The slurry seal shall be placed at a rate to produce 12 to 15 pounds of aggregate per square yard for Type II slurry. The exact rate will be determined by the County appointed Construction manager. The complete mixture shall be such that the slurry seal mixture has proper workability and will permit traffic flow within two (2) hours after placement without the occurrence of bleeding, raveling, polishing, separation, or other distress within 30 days after its placement.
2. Asphaltic emulsion shall be added at a rate of 15 percent by weight of the dry aggregate. The exact rate will be determined by the County appointed Construction Manager. The quantity of asphaltic emulsion to be used in the slurry seal mixture will be determined by the design asphalt binder content, as approved by the Engineer, and the asphalt solid content of the asphaltic emulsion furnished.
3. The Contractor shall sweep all slurry seal streets two (2) days after the application of slurry seal with a power sweeper.

3.2 PROPORTIONING

A. Proportion slurry seal ingredients in compliance with the authorized mix design. Proportion and blend different aggregate types before adding other ingredients. After proportioning, the slurry seal mixture must be workable. The slurry seal surface must be cured to allow traffic within 1 hour after placement. The Slurry seal must not show bleeding, raveling, separation, or other distresses for 15 days after placing.

B. Asphaltic emulsion shall be added at a rate of fifteen percent (15%) by weight of the dry aggregate. The exact rate will be determined by the County appointed Construction Manager.

3.3 MIXING AND SPREADING EQUIPMENT

A. General
1. Mixing and spreading equipment for slurry seal must proportion asphaltic emulsion, water, aggregate, and any set-control additives by volume and mix them in continuous pugmill mixers. Continuous pugmill mixers must be of adequate size and power for the type of materials to be mixed.

B. Truck Mounted Mixer Spreaders
1. Truck mounted mixer spreaders must comply with the following:
    a. Rotating and reciprocating equipment must be covered with metal guards.
    b. Proportion aggregate using a belt feeder with an adjustable cutoff gate. The Engineer verifies the height of the gate opening.
    c. Belt feeder must have a depth monitor device. The depth monitor device must automatically shut down power to the belt feeder when the aggregate depth is less than 70 percent of the target depth.
    d. Separate monitor device must detect the revolutions of the belt feeder. This device must automatically shut down power to the belt feeder if it detects no revolutions. If the belt feeder is an integral part of the equipment’s drive chain, the monitor device is not required.
    e. Aggregate belt feeder must be connected directly to the drive on the emulsion pump. The aggregate feeder drive shaft must have a revolution counter reading the nearest 0.10 revolution for micro-surfacing, and nearest 1 revolution for slurry seal.

f. Emulsion storage must be equipped with a device that automatically shuts down power to the emulsion pump and aggregate belt feeder when the level of stored emulsion is lowered. To allow for normal fluctuations, there may be a delay of 3 seconds between detection of low emulsion storage levels or low aggregate depths and automatic power shut down.
g. Emulsion storage must be located immediately before the emulsion pump.
h. Emulsion storage tank must have a temperature indicator at the pump suction level. The indicator must be accurate to ±5 degrees F.
i. No-flow and revolution warning devices must be in working condition and comply with California Test 109. Low-flow indicators must be visible while walking alongside the equipment.

C. Continuous Self-Loading Mixing Machine
1. Continuous self-loading mixing machines must be automatically sequenced and self-propelled. The mixing machine must deliver each material to a double shafted mixer and discharge the mixed material on a continuous flow basis. The mixing machine must have sufficient storage capacity to maintain a continuous supply of material to the proportioning controls. The mixing machine operator must have full control of forward and reverse speeds during placement.

D. Slurry Seal Equipment
1. General
a. Introduce emulsion into the mixer with a positive displacement pump. If you use a variable-rate pump, the adjusting unit must be sealed in its calibrated position.
b. Introduce water into the mixer with a meter that measures gallons.
c. Identifying numbers for equipment must be at least 2 inches high and located on the front and rear of the vehicle.
2. Spreader Box: The spreader box used to spread the slurry mixture must be:
a. Capable of spreading an entire lane width.
b. Equipped with flexible rubber belting on each side. The belting must contact the pavement to prevent loss of slurry from the box.
c. If wider than 7.5 feet, equipped with baffles, reversible motor-driven augers, or equivalent features to uniformly apply the slurry seal on superelevated sections and shoulder slopes.
d. Equipped with rear flexible strike-off blades in close contact with the pavement and adjustable to various crown shapes to uniformly apply the slurry seal.
e. Equipped with flexible drags attached to the rear and cleaned daily and changed if longitudinal scouring occurs.
f. Clean and free of slurry seal or emulsion at the start of each work shift.
3. The spreader box shall be clean and free of all slurry seal and emulsion at the start of each working shift.

3.4 SAND BLOTTER

A. A sand blotter shall be spread at selected driveways, intersections, and where required by the Engineer to accommodate pedestrian or vehicular traffic until the slurry set.

3.5 SURFACE PREPARATION

A. All existing striping and pavement markers shall also be removed prior to the application of the slurry seal. The slurry shall be applied within 72 hours after the removal of pavement striping marker.

B. Before application of slurry seal, the pavement surface shall be cleaned by removing loose particles of extraneous materials, including paving and dirt by sweeping with pickup broom/mobile type sweepers with water spray bars to reduce dust. The County appointed Construction Manager shall approve of the type of sweeper to be used. If necessary, more than one sweeper shall be used. Sidewinder sweepers or brooms that windrow material and do not remove it shall not be used. Completion of sweeping shall be evidenced by the absence of all loose particles of paving, dirt and other extraneous material, on the roadway, in the gutters, and other affected areas. If needed, all areas shall be swept a second time or more if necessary in the same manner or as directed by the County appointed Construction Manager prior to placing the slurry seal.

C. All material gathered shall be properly disposed of by the Contractor. The Contractor shall remove all plant material growing in the street or on the interface of the asphalt surface with the lip of concrete gutter prior to placing slurry.

D. Immediately preceding the slurry seal application, the Contractor shall cover all grates, slotted manholes, and other appurtenances on the pavement that would allow the entry of slurry; cover all manhole covers, water and gas valve box covers, monuments boxes, grates and other exposed facilitates with plastic oil resistant construction paper secured by tape or adhesive. The Contractor prior to the final set of the slurry shall uncover all covered manholes, valves, grates and boxes. All uncovered items shall be clean and meet the requirement of the Project Inspector.

E. All catch basin grates and hoods adjacent to the work or within 50 feet shall be covered to prevent slurry from entering the catch basin.

F. If slurry seal activities affect access to public parking, residential property, or commercial property, notify residents, businesses, and local agencies at least 24 hours before starting activities. The notice must:
1. Describe the work to be performed
2. Detail streets and limits of activities
3. Indicate work hours
4. Be authorized

G. Before starting slurry seal activities, post signs at 100-foot intervals on the affected streets. Signs must display *No Parking – Tow Away*. Signs must state the day of the week and hours parking or access will be restricted.

H. Within 1 hour after placement, slurry seal must be set enough to allow traffic without pilot cars. Slurry seal must be exhibit distress from traffic such as bleeding, raveling, separation or other distresses.

3.6 APPLICATION OF SLURRY SURFACE

A. General

1. Longitudinal and transverse joints must be:
    a. Uniform
    b. Straight
    c. Neat in appearance
    d. Butt-type joints
    e. Without material buildup
    f. Without uncovered areas
2. Place longitudinal joints:
    a. On centerlines, lane lines, edge lines, or shoulder lines
    b. With overlaps not more than 3 inches
3. Set the leading edge of kraft paper on transverse joints to create a straight butt joint with the next application when the paper is removed.
4. Weigh or gallonage tags shall be furnished to the County appointed Construction Manager by the Contractor for all materials delivered to the Project for slurry seal, including aggregate and asphaltic emulsion.

B. The surface shall be fogged with water directly preceding the spreader. The slurry mixture shall be of the desired consistency when deposited on the surface. Total time of mixing shall not exceed four (4) minutes. A sufficient amount of slurry shall be carried in all parts of the spreader at all times so that the complete coverage is obtained. No lumping, balling or unmixed aggregate shall be permitted. No segregation of the emulsion and aggregate fines from the coarse aggregate will be permitted. If coarse aggregate settles to the bottom of the mix, the slurry will be removed from the pavement. No excessive breaking of the emulsion will be allowed in the spread box. No streaks such as those caused by oversize aggregate will be left in the finished pavement.

C. Slurry seal shall be spread at a rate of twelve (12) to fifteen (15) pounds of dry aggregate per square yard. The exact rate will be determined by the County appointed Construction manager. The forward speed of the slurry spreader shall be adjusted to eliminate corrugations or surface irregularities in the slurry seal, which are caused by excessive speed.

D. The entire pavement, including the area around curb return shall be covered from gutter lip to gutter lip. The ends of slurry seal streets shall be a clean, straight line created by placing 15 lb felt paper with a 30 in. minimum width to create the line.

E. Longitudinal joints must correspond with lane lines. You may request other longitudinal joint patterns if they do not adversely affect the slurry seal.

F. Spread slurry seal in full lane widths. Do not overlap slurry seal between adjacent lanes more than 3 inches.

G. Use kraft paper at transverse joints and over previously placed slurry seal to prevent double placement. Remove the paper after use. Use hand tools to remove spillage.

H. The finished surface must be smooth. No excessive buildup, or unsightly appearance shall be permitted on longitudinal or transverse joints. Burlap drags shall be used and changed daily.

I. The mixture must be uniform and homogenous after spreading, and there must not be separation of the emulsion and aggregate after setting.

J. Approved squeegees shall be used to spread slurry in non-accessible areas to the slurry mixer. Care shall be exercised in leaving no unsightly appearance from handwork.

K. Slurry application will be stopped to allow sufficient time to allow slurry to cure prior to opening streets to traffic. Protect the slurry seal from damage until it has cured.

L. Any excess slurry from the gutters must be removed immediately. The Contractor shall not continue to the next street for slurry sealing until all excess slurry is removed as determined by the County appointed Construction Manager.

M. All streets shall be swept by the Contractor two days after completion of the slurry seal to remove any loose aggregate. The Contractor shall perform additional sweeping after placement of the slurry seal to ensure that any loose rock is removed, ad the direction of the County appointed Construction Manager.

N. The Contractor shall conform slurry sealed to the existing manholes, gas and water valves, monuments, concrete valley gutters and concrete curbs and gutters, as directed by the County appointed Construction Manager in the field. Hydrant markers shall be cleaned as directed by the County appointed Construction Manager at the Contractor's expense. Slurry seal that is overlapped on manholes, gas and water valves, monuments, concrete valley gutters and concrete curbs and gutters shall be cleaned, as directed by the County appointed Construction Manager, at the expense of the Contractor, and no additional compensation will be allowed therefore.

3.7 WEATHER LIMITATIONS

A. The slurry seal shall not be applied when either atmospheric or pavement temperature is 50 degrees Fahrenheit and falling but may be applied when either the atmospheric or pavement temperature is above 50 degrees Fahrenheit and rising. The slurry seal shall not be applied during periods of abnormally high relative humidity.

3.8 SLURRY REPAIR

A. In the event that the applied slurry seal surface violates the project requirements or has the following conditions:
   1. Tire or wheel marks
   2. Longitudinal ridges
   3. Picked up or raveled areas
   4. Transverse ridges or bumps
   5. Washboarding or excessively rough sand blotters

B. The slurry seal shall be repaired as follows:
   1. The slurry seal shall be removed by a "PENHALL PROFILER" or equal and a full lane width pass of slurry seal applied in full compliance with these specifications.
   2. The Engineer may omit removal of the affected slurry seal if it would not affect the repair.

C. The Contractor shall be responsible for any damage or stains to the existing striping and pavement markers, curbs and gutters, and roadways and driveways that occur during the course of this Contract. Stains will be cleaned by sandblasting, or any other method satisfactory to the County appointed Construction Manager. Damage or stains caused by the Contractor's operations shall be repaired or replaced by the Contractor at his expense and to the satisfaction of the County appointed Construction Manager, and no additional compensation will be allowed therefore.

3.9 STRIPING

A. Temporary striping and legends shall be placed on the newly slurry sealed streets prior to the release of streets to traffic. These materials must be submitted to the Engineer for approval prior to installation.

B. Permanent striping shall be installed after seven (7) days but no later than ten (10) days after the slurry seal is complete in accordance with Section 321723, Pavement Markings.

END OF SECTION – 321400

SECTION 321441

SAND-SET FLAGSTONE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Sand Set Flagstone pavers

B. Related Sections include the following:

1. Section 329119 “Landscape Finish Grading”
2. Section 312000 “Earthwork”

1.3 ACTION SUBMITTALS

A. Product Data

1. Flagstone Material: Source information and images.
2. Sand Setting Bed Material: Sieve analysis.
3. Joint Sand Material
4. Setting Bed Mortar for edge pavers.

B. Samples for Initial Selection: For the following:

1. Provide a minimum of (2) types of stone as defined in 2.1A.
2. For each stone provide approximately (2) 18 x 18 inch samples of each type.
3. Deliver samples to site for review.

C. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C136.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain pavers, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

B. Mockup – First Install: Construct a 8-foot x 8-foot area of paving to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquids in tightly closed containers protected from freezing.

PART 2 - PRODUCTS

2.1 FLAGSTONE PAVERS

A. Flagstone Pavers: Irregular Flagstone pavers in sizes as indicated in drawings.

1. Varieties and Sources:
   a. Source: Lygnso Garden Materials or approved supplier.
   b. Type:
      1) Silver Quartzite 3/4"-1-1/4” QFSS or approved equivalent
      2) Gold Quartzite 3/4"-1-1/4” QFSG or approved equivalent.

2.2 AGGREGATE SETTING-BED MATERIALS

A. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with graduation requirements in ASTM C 33 for fine aggregate.

2.3 MORTAR SETTING-BED MATERIALS

A. Portland Cement: ASTM C 150, Type I or II.

B. Hydrated Lime: ASTM C 207, Type S.

C. Sand: ASTM C 144.

D. Water: Potable.

2.4 JOINT MATERIALS

A. Gator Maxx Sand G2 or approved equivalent.

2.5 MORTAR MIXES

A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing times, and other procedures needed to produce setting-bed materials.

B. Portland Cement-Lime Setting-Bed Mortar: Type M complying with ASTM C 270, Proportion Specification.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.2 PREPARATION

A. Review and confirm installation and grading of substrate.

B. Compact soil subgrade uniformly to not more than 85 percent of ASTM D 698 and ASTM D 1557 laboratory density.

C. Coordinate installation of irrigation systems and electrical systems prior to paving installation.

3.3 INSTALLATION, GENERAL

A. Do not use pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.

B. Place separation geotextile over prepared subbase, overlapping ends and edges at least 12 inches (300 mm).

C. Place leveling course and screed to a thickness of 1 to 1-1/2 inches (25 to 38 mm), taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.

D. Place pavers in random flagstone layout as indicated in drawings.

E. Joint Pattern: variable joints ½ -inch minimum – 1-1/2- inches maximum.

F. Tolerances: Do not exceed 1/8-inch unit-to-unit offset from flush (lippage), 1/2 inch in 10 feet from level, or indicated slope, for finished surface of paving.

3.4 MORTAR SETTING-BED AT EDGE PAVERS

A. Apply mortar-bed at edge pavers as indicated in drawings.

3.5 REPAIRING, POINTING, AND CLEANING

A. Remove and replace pavers that are loose, chipped, broken, stained, or otherwise damaged.

B. Joints: During tooling of joints, enlarge voids or holes and completely fill with joint material. Point up joints to provide a neat, uniform appearance.

C. Cleaning: Remove excess joint material from exposed paver surfaces; wash and scrub clean.

END OF SECTION 321441

SECTION 321540

CRUSHED STONE SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Crushed Stone or Decomposed Granite paving with stabilizer binder additive.

B. Work specified elsewhere:

1. Section 329113 “Soil Preparation”
2. Section 329119 “Landscape Finish Grading”
3. Section 329200 “Turf and Grasses”
4. Section 329300 “Planting”
5. Section 329400 “Planting Accessories”
6. Section 334600 “Landscape Drainage”

1.3 ACTION SUBMITTALS

A. Product Data:

1. Crushed stone.
2. Binder.
3. AsphaltEdge.

B. Samples for the following:

1. 5 lb (2.2 kg) for each size and color range of decomposed granite/crushed stone.

C. Material Test Reports: Submit sieve analysis of proposed material to ensure it meets grading requirements.

D. Method Statement: Submit a written description of the mixing and application methods and rates endorsed by the Binder manufacturer.

E. Special Warranty: Submit a written warranty executed by the installer.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: Submit certified documentation of successful experience of no less than 3 years in the installation of similar crushed stone paving in comparable scale projects.

1.5 QUALITY ASSURANCE

A. Qualifications Installer: Require at least 3 years experience in similar work.

B. Qualifications Testing Laboratory: Require an approved independent agency qualified to conduct testing.

C. Tests: Test graduation of granite material in accordance with ASTM C 136.

D. Mockups-First Install: Construct mockup of ten foot square pavement to demonstrate surface finish, texture, color, and standard of workmanship.

1. Notify Owners Representative seven days in advance of dates and times when mockups will be constructed.
2. Obtain Owners Representative's approval of mockups before starting construction.
3. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
4. All installed paving must match the quality and conditions of the approved mock up.
5. Demolish and remove approved mockups from the site when directed by Owners Representative.

1.6 DELIVERY STORAGE AND HANDLING

A. Stockpile materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile away from edge of excavations. Do not store within drip line of remaining trees.
2. Protect crushed stone from contamination by foreign materials. Isolate stockpiles to prevent mixing of different aggregate grades. Prevent contamination by organic materials.
    a. Deliver perishable materials in original, unopened packaging. Protect from dampness.

1.7 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Do not install crushed stone paving during rain, while subgrade/subbase is wet or when ground is frozen.

B. The site must be free from rain for a minimum of 72 hours after stabilizer application. Temperature must be at least 40 ° F.

C. Field Measurements: Each bidder is required to visit the site of the Work to verify the existing conditions. No adjustments will be made to the Contract Sum for variations in the existing conditions.

1. Where surfacing is indicated to fit with other construction, verify dimensions of other construction by field measurements before proceeding with the work.

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: provide a written warranty executed by the installer agreeing to repair or replace components of stabilized surfacing that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Premature wear and tear, provide the material is maintained in accordance with manufacturer's written maintenance instructions.
2. Failure of system to meet performance requirements.

C. Warranty Period: Contractor shall provide warranty for performance of product. Contractor shall warranty installation of product for the time of one year from completion.

D. Contractor shall provide, for a period of ninety days, unconditional maintenance and repairs as required.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE

A. Class II Aggregate Base, refer to Section 321123 – Aggregate Base.

2.2 CRUSHED STONE

A. Crushed granite aggregate, California Gold

B. Grading requirements:

1. Percentage of Weight Passing a Square Mesh Sieve AASHTO T11-82 and T27-82

C. Suppliers: TMT Enterprises or approved equivalent.

D. Use only a single supply source for the entire quantity required.

E. Screening shall be clean, hard, durable particles of fragments of select granite. Fines shall be evenly mixed throughout the aggregate. When produced from gravel, 50 percent, by weight, of the material retained on a No.4 sieve shall have one fractured face.

F. The portion retained on the No.4 sieve shall have a maximum percentage of wear of 50 at 500 revolutions as determined by AASHTO T96-77. The portion passing a No. 4 sieve shall have a maximum liquid limit of 25 and a maximum plasticity index of 7, as determined by AASHTO T89-81, respectively.

2.3 BINDER

A. Manufacturer: TMT Enterprises or approved equivalent.

B. Product: PHP Stabilizer or approved equivalent.

2.4 EQUIPMENT

A. Equipment for Application: As recommended by binder manufacturer.

1. Compaction Equipment: Power roller weighing not less than 5 tons.

2.5 ACCESSORIES

A. Water: Fresh, clean, potable water.

2.6 EDGING

A. All edges not bordered by concrete paving, walls or buildings shall be retained with metal edge. See Drawings Materials Schedule for product information.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that adjacent subgrades, has been installed and is conforming prior to commencement of work.

3.2 PREPARATION

A. Protect structures, foundations, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by operations.

B. Provide erosion-control measures to prevent erosion, displacement of soils, discharge of soil-bearing water runoff or airborne dust to adjacent properties and completed work.

C. Subgrade Preparation: Scarify subgrade to depth of 10 inches, moisture-conditioned to at least two percent above optimum moisture content, and compacted to at least 90 percent relative compaction where the subgrade material consists of the existing sandy or clayey fill.

D. Aggregate Base Course: Moisture-conditioned to near optimum moisture content and compact to at least 90 percent relative compaction.

E. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with paving only after nonconforming conditions have been corrected.

F. Thoroughly clean subbase area of all debris, loose dirt and other extraneous materials before installing crushed stone. Do not install crushed stone when sub-base is wet or muddy.

3.3 PAVEMENT TOLERANCES

A. Comply with tolerances as follows: ACI 117 establishes few pavement tolerances. Below are based on ACI 330.1.

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus or minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long straightedge not to exceed 1/4 inch (6 mm) in any direction.
4. Slope: unless otherwise noted on the Drawings not less than 1% fall.
5. Settlement: less than 1/4 inch (6 mm) against adjoining pavements.

3.4 GRADING

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

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
    a. Finish Grading: Slope grades to direct water away from paving surface and buildings and to prevent ponding on pavements. Ensure positive drainage in all areas.

3.5 EDGING INSTALLATION

A. General: Install edging true to plan. Provide radial sections where required. Horizontal and Vertical variation shall not exceed a ½ inch over a 10-foot long straightedge in any direction.

3.6 MIXING

A. Materials Supplier to pre-blend PHP Stabilizer prior to delivery.

3.7 PLACING

A. After pre-blending, place the mix on prepared subgrade, and rake smooth using a steel line rake to desired grade and cross section.

B. Place to full thickness as indicated in the Drawings.

3.8 STABILIZER

A. Activate Stabilzer according to manufacturer's/suppliers directions.

3.9 COMPACTING

A. Compact crushed stone paving to the following percentages of maximum dry unit weight according to ASTM D 1557:

1. In uninterrupted paving: 95 to 100 percent.
2. In paving with trees: 85 to 90 percent.
    a. Hand-tamp edges around benches, signposts, etc. Compact using hand tamper, vibre roller, or vibre plate to obtain the final desired dense, smooth, uniform texture..

B. Take care compacting adjacent to planting and irrigation systems.

C. Ensure positive drainage in all areas.

3.10 FINISHING

A. Finish surface of paving to be smooth, uniform, and solid with no evidence of chipping or cracking. Dried, compacted material shall be firm all the way through with no “spongy” areas. Loose material shall not be present on the surface until after the first year of use. Tamp or roller marks shall not be present.

B. Smooth out any significant irregularities prior to Substantial Completion. Smooth by rewetting /saturating rough areas thoroughly, and then rolling the paving again.

3.11 FIELD QUALITY CONTROL

A. Inspection: Inspect for loose gravel on the surface, or unconsolidated crushed aggregate screenings below the surface, as evidence of improper bonding due to poor mixing or insufficient watering. Test the loose material for adequate stabilization by wetting, then tamping, and allowing it to dry. If the material is still unconsolidated, the Binder did not get mixed adequately throughout

the crushed aggregate screenings. If the material is solid, initial watering was insufficient. If cracking or sponginess is evidence of excessive Binder in the mix.

B. Patching: Dig out unconsolidated areas and replace with new crushed aggregate screenings with a high proportion of fines meeting the grading requirement above, preblended with Binder per the procedures listed above. Patched areas then shall be wetted thoroughly and rolled smooth. Patching shall be completed prior to any smoothing required.

3.12 PROTECTION

A. Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing at no cost to the Owner.

D. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration at no cost to the Owner.

3.13 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 321540

SECTION 321723

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Removal of existing traffic stripes and pavement markers

B. Removal of existing signs

C. Cleaning and sweeping of streets before application of traffic stripes and pavement markings

D. Materials and application for traffic stripes and pavement markings

E. Materials and application for pavement markers

F. Traffic control signs and street name signs

G. Object markers

H. Survey monuments

1.2 RELATED SECTIONS

A. Division 1, General Requirements

B. Section 033000, Cast-In-Place Concrete

1.3 RELATED DOCUMENTS

A. Caltrans Standard Specifications, 2015

1. Section 78, Incidental Construction
2. Section 81, Miscellaneous Traffic Control Devices
3. Section 82, Signs and Markers
4. Section 84, Markings

B. Caltrans Standard Plans, 2015

1. Plan A20A through A20D: Pavement Markers and Traffic Lines, Typical Details
2. Plan A24A and A24B: Pavement Markings Arrows

C. The State of California Traffic Manual, 2014

D. The regulations, standards, and tests of the State of California Department of Transportation Materials and Research Division, edition in effect at time of date on Plans.

E. Professional Land Surveyor's Act, Business and Professions Code §§ 8700 – 8805

1.4 SUBMITTALS

A. Submit product data for each of the following in accordance with Division 1, General Requirements:

1. Traffic paint
2. Pavement markers and adhesives
3. Reflectorized markers and posts

1.5 QUALITY ASSURANCE

A. Deliver certificates showing conformance with this specification to the Owners Representative with each shipment of materials and equipment to the Project site.

B. Provide proper facilities for handling and storage of products to prevent damage. Where necessary, stack products off ground on level platform, fully protected from weather.

1.6 PROJECT CONDITIONS

A. Do not apply traffic striping or pavement markings to the pavement until after approval to proceed has been given by the Owners Representative.

B. Thoroughly cure new asphalt concrete and portland cement concrete before application of stripes, markings or markers.

PART 2 - PRODUCTS

2.1 PAINTED STRIPES AND MARKINGS

A. Traffic stripes and pavement markings must be retroreflective. Within 30 days of applying traffic stripes and pavement markings, the retroreflectivity of the stripes and markings must be a minimum of 250 $mcd \cdot m^{-2} \cdot lx^{-1}$ for white when measured under ASTM E1710.

B. Painted striping and marking materials (including paint for cat tracks and dribble lines) and glass beads shall be furnished by the Contractor. Traffic stripes and pavement markings shall be painted with paint meeting the State of California Specifications for water-borne traffic stripes and pavement markings, white. The Contractor shall submit type and brand name of paint to be used to the County appointed Construction Manager for approval, and shall not commence application of paint prior to the County appointed Construction Manager written approval. Paint and glass beads shall conform to the following:

Paint	Specifications

Water Borne Traffic Stripe, White	2010-20B
Glass Beads	8010-004 (Type II)

State Specifications for traffic paint and glass beads may be obtained from the Office of Materials and Foundations, 5900 Folsom Boulevard, Sacrament, CA 95819, and (916) 227-7000. Thinning of paint will not be allowed.

C. Glass Beads shall be in accordance with Caltrans Standard Specification Section 84-2.02D, Glass Beads, unless noted otherwise herein or on the Plans.

2.2 SIGNS

A. Conform to manufacturer, style, size, and shape shown on the Plans.

B. Posts: 2 inch inside diameter galvanized iron pipe (Sch 40) pipe unless noted otherwise on the Plans.

C. Post Foundations: Portland cement concrete in accordance with Section 033000, Cast-In-Place Concrete.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. The Contractor is advised that, prior to asphalt concrete paving operations, it will be his responsibility to identify and tie-out all existing traffic stripes and pavement markings to be replaced within the Project limits, and to replace such traffic stripes and pavement markings to the existing locations, unless otherwise directed by the County appointed Construction Manager. The County appointed Construction manager shall inspect and approve the location and tie-outs for all such traffic stripes and pavement markings.

B. The Contractor is reminded of the importance of public safety and the need to complete all traffic stripes and pavement markings in a timely manner. Therefore, unless otherwise approved in writing by the County appointed Construction Manager, Contractor shall: (1) commence placement of cat-tracks no later than seven (7) working days after completion of paving operations; and (2) commence placement of permanent traffic stripes and pavement markings within two (2) working days after approval of cat-tracks.

C. The County appointed Construction Manager shall have five (5) working days to review and accept or reject cat-tracks. The Contractor shall not commence installation of permanent traffic stripes and pavement markings prior to approval of cat-tracks by the County appointed Construction Manager.

D. Should the Contractor proceed with the installation of permanent traffic stripes and pavement markings prior to approval of cat-tracks, Contractor shall remove all incorrectly installed permanent traffic stripes and pavement markings, as determined by the County appointed Construction Manager, and re-install as directed and approved by the County appointed

Construction Manager. All such work shall be at the Contractor's sole expense, and no additional compensation will be allowed therefore.

E. Should the Contractor fail to adhere to the above schedule for traffic stripes and pavement markings, Contractor may incur task-specific liquidated damages in the amount of $500 per calendar day for every day hence until traffic striping and pavement markings have been completed, as shown on the Plans, and as directed by the County appointed Construction Manager.

3.2 REMOVAL OF TRAFFIC STRIPES, PAVEMENT MARKINGS AND PAVEMENT MARKERS

A. Where blast cleaning is used for the removal of painted traffic stripes and pavement markings, or for removal of objectionable material, remove the residue, including dust and water, immediately after contact with the surface being treated. Remove by a vacuum attachment operating concurrently with the blast cleaning operation.

B. Where grinding is used for the removal of thermoplastic traffic stripes and pavement markings; remove the residue by means of a vacuum attachment to the grinding machine. Do not allow the residue to flow across or be left on, the pavement.

C. Where markings are to be removed by blast cleaning or by grinding, the removed area shall be approximately rectangular so that no imprint of the removed marking remains on the pavement.

D. Waste from removal of yellow painted traffic stripe may contain lead chromate. Residue produced when yellow paint is removed may contain heavy metals in concentrations that exceed thresholds established by the California Health and Safety Code and may produce toxic fumes when heated. As such, when grinding or other methods approved by the Owner's Representative are used to remove yellow painted traffic stripes, the removed residue, including dust, shall be collected and contained immediately. The Contractor shall submit a written work plan for the removal, storage, and disposal of yellow painted traffic stripe to the Owner's Representative for approval not less than fifteen (15) days prior to the start of the removal operations. Removal operations shall not be started until the Owner's Representative has approved the work plan.

E. Locations where existing traffic stripes and pavement markings have been removed by the Contractor to a depth of 3/8" or more when compared to the adjacent pavement surfaces shall be patched by the Contractor with Type B, ¼" (No. 4, maximum) fine graded asphalt concrete. Patching required due to grinding operations shall be solely at the Contractor's expense. Immediately following the grinding operation, the Contractor shall remove the grindings from the roadway by sweeping or other methods approved by the County appointed Construction manager.

F. Contractor will be responsible for repairing any damage to the pavement during removal of pavement markers. Damage to the pavement, resulting from removal of pavement markers, shall be considered as any depression more than 1/4-inch deep.

3.3 TEMPORARY PAVEMENT MARKERS

A. If permanent pavement markers cannot be installed immediately, and the street or road is to be placed in service, install short term, temporary pavement markers on the new pavement prior to opening the street or road to traffic.

B. Place markers, at a minimum, of 24 feet on centers, or as required by the governmental agency having jurisdiction, in the appropriate colors to delineate centerlines and travel lanes on multi-lane roadways.

3.4 PAINTED TRAFFIC STRIPES AND PAVEMENT MARKINGS

A. The Contractor shall be responsible for ensuring that the final traffic stripes and pavement markings match the layout as existing and proposed traffic stripes and pavement markings, unless otherwise shown on the Plans or directed by the County appointed Construction Manager. Traffic stripes and pavement markings not conforming to existing and approved layout shall be removed and re-applied, all at the Contractor's expense, and no additional compensation will be allowed therefore.

B. The Contractor shall indicate, on the road, the traffic stripes and pavement marking layouts, including the Standard Plan detail number (with the beginning and end of each detail marked) and shall receive approval of layout (alignment, location, and detail) from the County appointed Construction Manager, in writing, prior to final placement. Methods used by the Contractor for alignment and layout shall not damage the pavement. Any damage to the pavement caused by the Contractor's operations, as determined by the County appointed Construction Manager, shall be repaired by the Contractor, all at Contractor's sole expense, and no additional compensation will be allowed therefore.

C. Do not thin paint for traffic stripes and pavement markings. Mix the paint by mechanical means until it is homogeneous. Thoroughly agitate the paint during its application.

D. Use mechanical means to paint traffic stripes and pavement markings and to apply glass beads for traffic stripes.

E. The striping machine must be capable of superimposing successive coats of paint on the 1st coat and on existing stripes at a speed of at least 5 mph. The striping machine must:

1. Have rubber tires
2. Be maneuverable enough to produce straight lines and normal curves in true arcs
3. Be capable of applying traffic paint and glass beads at the specified rates
4. Be equipped with:
    a. Pointer or sighting device at least 5 feet long extending from the front of the machine
    b. Pointer or sighting device extending from the side of the machine to determine the distance from the centerline for painting shoulder stripes
    c. Positive acting cutoff device to prevent depositing paint in gaps of broken stripes
    d. Shields or an adjustable air curtain for line control
    e. Pressure regulators and gauges that are in full view of the operator for a pneumatically operated machine
    f. Paint strainer in the paint supply line

g. Paint storage tank with a mechanical agitator that operates continuously during painting activities
h. Glass bead dispenser located behind the paint applicator nozzle that is controlled simultaneously with the paint applicator nozzle
i. Calibrated rods for measuring the volumes of paint and glass beads in the paint and glass bead tanks

F. Air-atomized spray equipment must:

1. Be equipped with oil and water extractors and pressure regulators
2. Have adequate air volume and compressor recovery capacity
3. Have properly sized orifices and needle assemblies for the spray gun tip

G. Where the configuration or location of a traffic stripe is such that the use of a striping machine is not practicable, the traffic paint and glass beads may be applied by other methods and equipment if authorized. The Engineer determines if the striping machine is not practicable for a particular use.

H. For an existing surface, apply traffic stripes and pavement markings in 1 coat. For a new surface, apply traffic stripes and pavement markings in 2 coats. The 1st coat of paint must be dry before applying the 2nd coat.

I. Apply each coat of paint for any traffic stripe in 1 pass of the striping machine, including the glass beads, regardless of the number, width, and pattern of the individual stripes. Do not paint traffic stripes and pavement markings if:

1. Freshly painted surfaces could become damaged by rain, fog or condensation
2. Atmospheric temperature could drop below 50 degrees F for waterborne paint during the drying period.

J. Application rate of traffic paint and beads shall be:

Roadway Markings	Rate of Application
First Coat	100 to 110 square feet gallon
Second Coat	100 to 110 square feet per gallon
Glass Beads	6 to 8 pounds per gallon of applied paint

K. The types, dimensions and approximate locations of the existing traffic stripes and pavement markings are shown on Sheets C2.0-C2.5 of the Plans. The Contractor is advised that it will be his responsibility to identify all existing traffic stripes and pavement markings within the Project limits and to replace these traffic stripes and pavement markings to existing locations. Any existing centerline striping shall be replaced with pavement markers, unless otherwise indicated on the Plans. Prior to commencing any cape seal, slurry seal, etc. operations, the Contractor and the Engineer shall inspect the location of all traffic stripes and pavement markings to be replaced with painted stripes, pavement markers, or painted markings.

3.5 SIGNS

A. Install in accordance with the manufacturer's instructions and as shown on the Plans.

B. Horizontal location shall be as shown on the Plans.

C. Portland cement concrete for post foundations shall be of the configuration shown on the Plans.

3.6 PROTECTION

A. Protect the newly installed traffic stripes and pavement markings from damage until the material has cured.

B. Replace any traffic stripes or pavement markings or markers broken, misaligned or otherwise disturbed prior to opening roadway to traffic.

3.7 RESTORATION OF EXISTING IMPROVEMENTS

A. Existing signs striping or other markings removed or damaged due to the installation of new facilities shall be replaced in kind.

B. Existing landscaping or planting removed, damaged or disturbed due to the installation of traffic control signs or street name signs shall be replaced in kind.

END OF SECTION – 321723

SECTION 321800

ATHLETIC AND RECREATIONAL SURFACING

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION

A. Surface preparation and surfacing requirements for tennis/pickleball and basketball courts.

1.2 RELATED SECTIONS

A. Related Work

1. Section 312000 “Earthwork”
   Section 321216 “Asphalt Concrete”
2. Section 329119 “Landscape Finish Grading”

1.3 QUALITY ASSURANCE

A. Surfacing shall conform to the guidelines of the ASBA for planarity.

B. All surface coatings products shall be supplied by a single manufacturer.

C. The contractor shall record the batch number of each product used on the site and maintain it through the warranty period.

D. The contractor shall provide the inspector, upon request, an estimate of the volume of each product to be used on the site.

E. The installer shall be an authorized applicator of the specified system.

F. The manufacturer’s representative shall be available to help resolve material questions.

1.4 SUBMITTALS

A. Reference list from the installer of at least 5 projects of similar scope done in each of the past 3 years.

B. Product Data: Manufacturer specifications for components, color chart and installation instructions.

1.5 MATERIAL HANDLING AND STORAGE

A. Store materials in accordance with manufacturer specifications and MSDS.

B. Deliver pavement-marking materials to Project site in original packages with seals unbroken

C. All surfacing materials shall be non-flammable.

1.6 GUARANTEE

A. Provide a guarantee against defects in the materials and workmanship for a period of two years from the date of substantial completion.

1.7 INSTALLER QUALIFICATIONS

A. Installer shall be regularly engaged in construction of sport court surfacing. Minimum five years of experience required installing EPDM synthetic surfacing required and a minimum of ten court installations total.

B. Installer shall be an Authorized Applicator of the specified surface system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Court surfacing materials shall be Laykold or approved equal.

1. Substitutions: Submit requests at least 7 days prior to the bid date with a complete type written list of proposed substitutions with sufficient data, drawings, samples and literature to demonstrate to the owners satisfaction that the proposed substitution is of equal quality and utility to the specified product. Information must include a QUV test of at least 1000 hours illustrating the UV stability of the system. The system shall have an ITF pace rating in Category.
2. Under no circumstance may the final color surface contain silica sand added at the job site.

2.2 SURFACING MATERIALS

A. Product: Laykold Cushion Plus Standard or approved equivalent.

PART 3 - EXECUTION

3.1 WEATHER LIMITATIONS

A. Do not install when rainfall in imminent or extremely high humidity prevents drying.

3.2 GENERAL

A. New asphalt and concrete pavement shall cure for 14 days prior to application of any surfacing materials.

B. The surface to be coated shall be inspected and made sure to be free of grease, oil, dust, dirt and other foreign matter before starting work.

C. Protect adjacent areas and structures (fences, posts, sidewalks, buildings, etc.) which are not to be coated. In the event that coatings are applied to above, remove immediately before drying is complete.

3.3 APPLICATION

A. Application shall proceed only if the surface is dry and clean and the temperature is at least 50 degrees F and rising and the surface temperature is not in excess of 140 degrees F.

B. Apply surfacing according to manufacturers recommendations.

3.4 PROTECTION

A. Erect temporary barriers to protect coatings during drying and curing.

B. Lock gates to prevent use until acceptance by the owner’s representative.

3.5 CLEAN UP

A. Remove all containers, surplus materials and debris. Dispose of materials in accordance with local, state and Federal regulations.

B. Leave site in a clean and orderly condition.

END OF SECTION 321800

SECTION 321813

SYNTHETIC TURF

(SECTION PROVIDED FOR REFERENCE)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes synthetic grass surfacing.

1. The Synthetic Turf for the Small Multiuse Field and the volleyball seating area shall be provided and installed by a vendor through a California Multiple Award Schedule (CMAS) procurement process.

2. Refer to the Section 013113 “Coordination” and the Plans for notes regarding the scope of work included in this Contract and the CMAS procurement scope.

B. Related Requirements:

1. Section 312000 “Earthwork”
2. Section 321815 “Synthetic Turf Base Courses”
3. Section 329119 “Landscape Finish Grading”

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Include representatives from the General Contractor, relevant SubContractors, the Synthetic Turf Vendor/Installer and the Owner’s Construction Management Team.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of synthetic grass surfacing indicated.

1. Turf Fabric: 12 inches square.
2. Infill Material: 4 oz. of each type.
3. Shock-Attenuation Pad: 12 inches square.
4. Seam Sample: 24 inches square with seam centered in sample.
5. Marking Sample: 24 inches square with seam/marking centered in sample.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For synthetic grass surfacing, including maintenance cleaning instructions, to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials in location and manner to allow installation of synthetic grass surfacing without excess disturbance of granular base.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace synthetic grass surfacing that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Deterioration and excessive wear.
    b. Deterioration from UV light.
    c. Excessive loss of shock attenuation.
    d. Seam separation, including game lines and markings.
2. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYNTHETIC GRASS SURFACING

A. Turf Fabric: Complete surfacing system, consisting of synthetic yarns bound to water-permeable backing and infill indicated, suitable for multipurpose sport playing fields.

1. Field Turf, Vertex Core

B. Backing: Manufacturer's standard

C. Infill:

1. Infill Proportions:
    a. PureFill Cork: 1.1 Lbs/ft2
    b. Sand Infill: 4.5 Lbs/ft2

D. Game Lines and Markings: Provide game lines and markers in widths and colors according to requirements indicated on Drawings.

1. Application Method: Tufted in to the maximum extent practicable, with remaining lines inlaid.

E. Seaming Method: Hot melt.

2.2 MATERIALS

A. Cork: PureFill Cork

B. Seam Tape: Synthetic grass manufacturer's recommended seam tape, minimum 18 inches wide for inlaid game lines.

C. Shock-Attenuation Pad: Field Turf, Shock Base Pro

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine subgrade, perimeter curb and other conditions, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Avoid disturbance of base during installation of shock-attenuation pad and turf fabric.

B. Shock-Attenuation Pad Installation: Roll out pad and allow to relax a minimum of six hours prior to final fit and trim. Stagger head seams between adjacent rows. Fit seams snugly without stretching or forcing.

C. Roll out turf fabric and allow to relax at least four hours prior to seaming.

D. Provide seams flat and snug, with no gaps or fraying. Remove yarns that are trapped within seams. Attach turf fabric to perimeter restraint system as recommended by the manufacturer.

E. Install inlaid game lines and markings by cutting through turf fabric and installing snugly fitting game line turf fabric. Provide seaming tape that extends minimum 6 inches beyond seam.

F. Repair loose seams and bubbles formed due to expansion of turf fabric prior to installation of infill.

G. Evenly broadcast and groom infill by machine in proportions and depth after settling as recommended by the manufacturer, and to meet indicated performance requirements. Rake fibers trapped by infill to surface.

END OF SECTION 321813

32 18 15
SYNTHETIC TURF BASE COURSES
(SECTION PROVIDED FOR REFERENCE)

PART 1 - GENERAL

1.1 SUMMARY

A. The Synthetic Turf for the Small Multiuse Field and the volleyball seating area shall be provided and installed by a vendor through a California Multiple Award Schedule (CMAS) procurement process.

B. Refer to the Section 013113 “Coordination” and the Plans for notes regarding the scope of work included in this Contract and the CMAS procurement scope.

C. Section Includes:
   1. Separation Geotextile Fabric
   2. Crushed Aggregate Permeable Base
   3. Underdrains
   4. HDPE Perimeter Piping and Clean Outs
   5. Infiltration Trench and Drain Rock
   6. Turf Fabric Attachment Nailer

D. Related work specified elsewhere:
   1. Section 312000 "Earthwork"
   2. Section 033000 “Cast in Place Concrete”
   3. Section 328400 “Irrigation System”
   4. Section 321813 “Synthetic Turf”

1.2 DESCRIPTION OF WORK:

A. The general contractor shall provide the synthetic turf aggregate base and drainage systems and related appurtenances, including but not limited to HDPE Perimeter Piping, perimeter & edge anchorage details, crushed aggregate permeable base, ready to receive the synthetic turffabric.

1.3 QUALITY ASSURANCE

A. Contractor qualifications:
   1. Installers of the synthetic turf base system shall:
      a. Possess a Class A California Engineering Contractor’s License.
      b. Have prior direct experience in preparing a drainage base for synthetic turf sports fields and must have installed a minimum of 10 such base systems in California during the past 3 years, with a minimum size of 75,000 SF per synthetic turf field. Contractor shall submit previous experience and references for each project at time of Bid submittal. Previous experience submittal form is provided in bid documents – See Section 2.11

2. Submit evidence of installations contractor's qualifications prior to award of bid.

B. Changes & Substitutions:
1. The contractor shall strictly adhere to the procedures outlined under this Section. Any variance from these requirements shall be identified in writing in submittal to be reviewed and accepted by the Owners representative.

C. Permeable Base Planarity and Compaction Requirements:
1. Completed Work of this section shall comply with the following:
a. Compaction of sub-grade (lime treat): minimum 90% ASTM 1557-Modified Proctor density.
b. Planarity of sub-grade: tolerance of one quarter inch (1/4") in ten feet (10').
c. Top of subgrade elevations shall be within ¼" -inch plus or minus from the elevations shown on the plans. In addition, no point within the 25-foot grid deviates more than ¼"-inch from any other adjacent point within the 25-foot grid.
d. Compaction of crushed aggregate permeable base: Shall be compacted to a minimum of 90%, and no more than 92%, ASTM 1557- Modified Proctor density.
e. Surface tolerance of crushed aggregate permeable base: not to exceed 1/4 inch over 10 feet and ½" from design grade.

D. Coordination:
1. Coordinate locations of connections to storm drainage system.

2. Coordinate work with installation of underground piping beneath synthetic turf and with installation of field appurtenances such as cool-down heads, electrical outlets in synthetic turf and other items required by Contract Documents.

1.4 FIELD QUALITY CONTROL & ACCEPTANCE OF WORK

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing. Contractor shall provide project schedule and timeline to recognize, allow for and coordinate with the geotechnical engineer's specified testing operations. Refer to letter titled "Supplemental Recommendations for Synthetic Turf Field."

1. Tests shall include compaction and Proof Roll testing of sub-grade, finish grade and each lift of synthetic turf base, measured at a minimum of 12 locations randomly spaced across the surface of each field.

2. The Independent Testing Agency shall also test the crushed aggregate permeable base material prior to delivery to the job site to verify that material meets the specified gradation & permeability requirements. Frequency of sampling for gradation testing would be to sample every 500 tons of Engineered Permeable Base Rock delivered to the site. Rock not meeting Specifications will be rejected by the Owner's representative. Materials rejected by the Owner's representative shall be removed from the site at the Contractor's expense. It is the Contractor's responsibility to ensure that all permeable stone for the synthetic turf base meet the above requirements throughout the installation process, including transfer and delivery to the site, placement, spreading, compaction, and installation of turf material. Proper investigation into rock sources may be required by the Contractor to ensure that the rock that was bid will meet the project specifications.

3. In-situ drainage testing shall be provided for every 12,000 SF of Synthetic Turfsurface.\

4. The Owner's testing agent will evaluate these materials as specified using ASTM C136 and ASTM D75 testing protocol as a guideline

5. The Class II Permeable base should be placed under the observation of the Geotechnical Engineer's representative. Our experience is that higher relative compaction and compaction effort will reduce the infiltration rate of the permeable base material which reduces drainage of the surface water. If during construction observation the field density testing indicates a higher relative compaction, we recommend that at least 10 infiltration tests be performed on the field in accordance with ASTM F2898 to confirm the base has an infiltration rate that meets project specifications. If heavy trucks are allowed to make repeated trips across the permeable rock surface, the surface should be re-scarified and lightly rolled before infiltration testing is performed. If the material becomes mishandled, segregated, or broken down and not suitable for its intended purpose in the opinion of the designer or geotechnical engineer, it should be removed and replaced at no additional cost to the client.

Installed drainage properties to comply with the following drainage testing: ASTM F 2898, "Standard Test Method for Permeability of Synthetic Turf Sports Field Base Stone and Surface System by Non-confined Area Flood test Method." Test shall exceed 10" per hour.

a. Final approval of infiltration requirements are to be through field testing only.

b. Methods not specifically listed above shall be submitted for approval.

6. Testing agency will test compaction of soils & base materials in place according to ASTM D 1557, ASTM D 6938, as applicable.

7. Contractor's surveyor will verify proper elevation of nailer board around entire perimeter of field,and submit to the Engineer for approval. Contractor's surveyor shall be a licensed California surveyor and shall be an independent sub consultant of the General Contractor

B. Owner provided independent testing agency results verifying compliance with compaction & permeability requirements shall be supplied and approved by owner's representative prior to the commencement of synthetic turf installation.

1. The synthetic turf contractor shall not proceed with the installation of the synthetic turf surfacing system until acceptable compaction and permeability test results have been achieved.

C. Contractor to provide surface planarity verification using a string line method in presence of synthetic turf contractor and owner.

1. A mason's line held taught between two workman 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 tolerances specified.

2. Final crushed aggregate permeable base elevations shall conform to the lines and grades shown on the drawings. The measured grades shall not deviate more than (1/2") from the planned grades and not vary more than (1/4") feet in 10 feet in any direction. Laser grading of the finish surface

is required.

3. General Contractor's responsibility shall include correction of any defects in synthetic turf aggregate base and edge anchorage details identified by the Owner's synthetic turf contractor.

4. Roller marks, tire tracks, footprints or other impressions on the finished surface shall be raked out where they are equal to or greater than the tolerances specified. Following long and short axis checking and corrections, the Contractor shall notify the Owner, that the finished surface is ready for inspection

5. The Contractor shall perform a final string line check along the long axis of the field in the presence of the Synthetic Turf Surfacing Installer. Finished surface planarity shall be approved by the Owner and Synthetic Turf installation contractor.

    a. Please be advised that the visual string line examination and acceptance of the base should not be used as a substitute for independent testing and analysis by a qualified professional engineer. As with all bases, there exists the possibility of hidden, latent or other defects that can only be reliably discovered through inspection, survey or testing by qualified experts in the fields of geology and soils engineering.

6. Damage to the finished surface planarity occurring after approval shall be corrected by the Contractor using the method described above.

D. Materials and Work not conforming to specified requirements shall be promptly removed, replaced and reinstalled as part of the work of this section at no cost to the Owner.

1.5 SUBMITTALS

A. General: Submit in accordance with General Provisions.

B. Contractor Qualifications.

C. Product Data: Submittals required:
1. Permeable aggregate base material including sieve size analysis & source
2. Subgrade/Trench Separation Barrier
3. HDPE pipe & fittings
4. 1.5" x 12" Panel Drains
5. Certification that the submitted products are in compliance with the specifications

D. Samples: Submittals required:
1. Subgrade/Trench Separation Barrier

PART 2 - PRODUCTS

2.1 SUBGRADE/ PERIMETER DRAINAGE TRENCH SEPARATION BARRIER

A. The prepared soil subsurface is to be isolated from the installed field and drainage system above it with a geotextile/geomembrane placed across the entire surface of the field. This insures no mixing of the soil sub surface with the aggregate drainage system.

1. Separation fabric shall be laid and overlapped in accordance with the manufacturers and project geotechnical engineer's written recommendations.

B. Subgrade/Trench Separation Barrier:

1. Geotechnical Engineer of Record shall review and approve separation barrier selection based on actual site conditions to achieve a firm unyielding base.

For permeable subgrade applications: Subgrade/Trench separation barrier shall be a 4oz. Non-Woven Geotextile – Mirafi 140N or approved equal

For plastic and moisture sensitive soils a non-permeable liner shall be recommended from the geotechnical engineer similar to the following, based on site conditions –

a. To reduce the potential for moisture fluctuation in the perimeter trench that extends beneath the lime treated section, we recommend a 10-mil visqueen along the sidewalls and extend a minimum of 8 to 12 inches into the trench bottom.

2.2 PERFORATED FLAT DRAIN AND HDPE PERIMETER PIPING

A. All specific pipes are noted on the Contract Drawings

B. 4" through 10" solid wall and perforated drainpipe shall be smooth interior wall conforming to AASHTO M252.

C. 12" through 36" solid wall and perforated drainpipe shall be smooth interior wall conforming to AASHTO M294 Type S.

D. Fittings and couplers shall be split couplings or snap couplings manufactured by the same manufacturer as the corrugated polyethylene pipe.

E. Panel Drains shall be a 3-dimensional rigid HDPE (1.5" x 12" flat panel pipe), Hydraway or AdvanEdge, MultiFlow, or approved equal.

2.3 PERMEABLE BASE

A. Permeable Base Material

B. Material to be open graded, fractured friction course that provides adequate mechanical stability and compaction for athletic field applications.

C. Material to be clean with minimal fines as described in gradation table below.

D. Material to be minimum 100% fractured with at least one mechanical fracture per particle greater than ¼” sieve size.

E. Comply with the below permeable base gradation (Caltrans Specifications Section 68):

Mesh Size	% Passing
1”	100
3/4"	90-100
3/8 ”	40-100
#4	25-40
#8	18-33
#30	5-15
#50	0-7
#200	0-3

1. Soft lime stones and shale materials are not acceptable.
2. Materials shall be tested at the Contractor's expense using a sulfate soundness test (ASTM C 88) and LA Abrasion Test (ASTM C 131).Test Method Sulfate Soundness (ASTM C 88) LA Abrasion (ASTM C 131)Criteria Not to exceed 12% Loss Not to exceed 40

F. Aggregate material for bedding and backfill around the Perforated Perimeter Collector pipe system shall be ASTM #57 Crushed Angular Stone and shall meet criteria A-C and D1-D2 above.
   1. #57 Stone containing 100% of the particles having one or more fractured faces. Bedding and backfill material shall be subject to the approval of the Engineer.

G. Aggregate material for perforated Perimeter Collector pipe planarity layer system shall be ASTM #89 Crushed Angular Stone and shall meet criteria A-C and D1-D2 above.

2.4 INFILTRATION TRENCH DRAIN ROCK

A. Clean and washed gravel and crushed angular rock. No recycled asphalt or concrete will be permitted.

B. AASHTO No. 57 stone with graduation as follows:

Sieve Size	%Passing
1.5 inches	100
1 inch	95-100
0.5 inch	25-60
No. 4	0-10
No. 8	0-5

2.5 INDEPENDENT CRUSHED AGGREGATE PERMEABLE BASE TESTING

A. Contractor to coordinate schedule as required for owners independent lab to continually monitor and test the crushed aggregate base as follows:
   1. Sampling and testing of crushed aggregate permeable base both at the batch plant and on- site will be performed to confirm that the proposed material is in conformance with the project specifications prior to and following deliver of material to the site. Contractor's representative shall be in attendance at batch plant and at project site at time of material acquisition by the owner-provided independent testing agency.

   2. Batch plant sampling and testing shall consist of a minimum of two (2) gradation samples.

   3. Contractor shall continuously monitor the requirements in sections 1.4 and 2.3 above throughout placement of the crushed aggregate permeable base material.

   4. On-site testing of the installed crushed aggregate permeable base shall be in accordance with section 1.4 above.

   5. The owners Testing Agent may choose to periodically inspect and/or obtain samples of aggregate materials at the source and/or as they are delivered or installed on site. Any rock aggregate material that does not conform to the approved submittal samples will be rejected immediately or tested by the Contractor Testing Agent to verify compliance with the specifications. Such tests shall imply no warranty of the Contractor's work or compliance with

the specifications.

1. Costs for initial aggregate material testing by the Owner's Testing Agent are the responsibility of the owner. Costs for any rock material testing by the Owner's Testing Agent on aggregate materials that are a replacement for aggregate materials that were rejected by the Owner's Testing Agent due to nonconformance with the specifications, Contractor's submittals or quality control test results, will be borne by the Contractor and may be invoiced to the Contractor by the Owner or deducted from the next Progress Payment.

2.6 PERIMETER CURBING AND TURF FABRIC ATTACHMENT NAILER

A. All perimeter curbing shall be formed utilizing either steel forms in good working order or 2" nominal dimensioned lumber.

1. Concrete curb shall be, trowel finished where exposed.
2. Concrete shall be as specified in project specifications and geotechnical report requirements for site concrete.

3. Synthetic Turf nailer board.
   a. HDPE, 2 x 4 nominal thickness, or equal
   b. Attachment anchors shall be tapcon screw type anchors of appropriate size spaced 12" center to center OR 18" wedge anchors 30" O.C. and installed in accordance with manufacturer recommendations
      1) If installing into old concrete wedge anchors shall be utilized in lieu of tapcon screws.

PART 3 - EXECUTION

3.1 PREPARATORY WORK

A. Examination of Site:

1. Examine site for conditions that will adversely affect execution, permanence, and quality of work.
2. Verify that underground utility & irrigation piping below sub-grade of synthetic turf base has been completed and the work of this section can properly proceed.
3. The Contractor shall be responsible to close and cover, in a manner acceptable to the Owner, any existing basins, which the Owner determines to be detrimental to the function of the new synthetic turf field.

3.2 EXCAVATION & SUB-GRADE PREPARATION

A. Methods as specified in Section "Excavation".

B. Sub-grade grading and preparation shall comply with criteria outlined in the project geotechnical report as it related to compaction, removal of existing material, percent organic matter, debri, etc…

C. Removal of materials beyond the indicated sub grade elevations, without authorization by the Engineer, shall be classified as unauthorized excavation. It shall be the responsibility of the Contractor to repair areas of over excavation in accordance with the specification for fill materials.

D. Sub-grade of the crushed aggregate permeable base material shall be sloped as shown on the drawings

E. Trench sub-grade locally as required to achieve design slopes on sub-drain collector pipes.

F. Compaction:

1. After sub-grade has been properly graded, contoured and sloped as required, compact soil materials as outlined in section 1.3 above.

G. Tolerances:
1. Compacted sub-grade shall conform to shall conform to section 1.3 above.

3.3 SUBGRADE/TRENCH SEPARATION BARRIER

A. The prepared soil subsurface is to be isolated from the installed field and drainage system above it with the specified separation barrier placed across the entire surface of the field.

B. The subgrade surface shall be free from large stones 3” or larger and sharp objects that may puncture or tear the separation barrier.

C. The separation barrier shall be placed and overlapped in accordance with the Manufacturer’s written recommendations.

D. The Subgrade/Trench separation barrier shall be continuous through the drainage trenches to insure separation of surrounding soil and drainage stone.

3.4 PERFORATED HDPE DRAINAGE PIPE

A. Examine the areas and conditions under which the subsurface drainage system work is to be installed. Correct any and all conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until satisfactory conditions have been corrected.

B. EXCAVATION FOR PIPE

1. Excavation shall consist of the removal of all material of every description to the depths and grades designated on the plans and specified herein.
2. If the material at or below the designated grade for which the pipe is to be laid is unsuitable for pipe foundation, then the material shall be removed to such depths and widths as required and replaced with approved foundation material.
3. Excavation for installation of pipes shall be in trenches to the lines, grades and widths as per the Contract Drawings and in accordance with Safety and Health Regulations (OSHA). In all cases trenches shall be excavated in a manner to ensure the proper and timely completion of the work.

C. INSTALLATION

1. Once said trench has been excavated to the proper lines, grades and widths, the geotextile fabric shall be installed as per Manufacturer's Specification.
2. Perforated HDPE drainage pipe shall be installed according to recommended installation practices by the pipe manufacturer.
3. Pipe laying work shall commence at the main collector line and shall proceed upgrade. Pipe shall be laid true to line and grade in such a manner as to assure a close concentric joint with the adjoining pipe.
4. Trenches shall be kept free of water and debris. Pipe shall not be laid when the condition of the trench or weather is unsuitable for such work.
5. Install Panel Drains as shown on Drawings.
6. At the completion of each drainage line installation, place a cap or plug in the up- stream end as to prevent unwanted material and debris from entering the pipe.

D. INSPECTION

1. After installation of pipe, inspect to determine whether line displacement or other damage has occurred.
2. Make inspections after lines have been installed prior to backfilling, during the backfilling process, and again at the completion of backfilling. Backfill material shall conform to the material as specified in section 2.3 above.
3. If inspection indicated poor alignment, debris, displaced pipe, infiltration or other defects, take whatever steps are necessary to correct such defects at no additional cost the Owner.

3.5 PERIMETER CURBING AND TURF FABRIC ANCHORAGE NAILER

A. A continuous perimeter concrete curb, either exposed or concealed as shown on plans, is required around the entire perimeter of all synthetic turf areas with #4 rebar.

B. Top of 2x4 nailer boards shall be set or recessed per the following table and as indicated on plans:

Pile Height	Nailer Depth
2.5” pile height	1.75”
2.25” pile height	1.5”
2” pile height	1.25”
1.6” Pile Height	1.0”

3.6 INSTALLATION OF PERIMTER HDPE DRAINAGE PIPE AND CRUSHED AGGREGATE PERMEABLE BASE

A. Place permeable base materials in layers not more than 6 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

1. Minimum nominal compacted thickness of base layer: 4 inches.

B. Place materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Placement of perimeter trench crushed aggregate:

1. Backfill shall be as shown on the plans. Place in 6-inch maximum loose lifts. Bring up evenly on each side, and for the full length of the structure. Ensure that no damage is done to structures or protective coatings thereon.
2. Use hand-operated plate type vibratory or other suitable hand tampers in areas not accessible to larger rollers or compactors. Be careful to avoid damaging pipes and protective pipe coatings.
3. Initial backfill and bedding shall be carefully packed under the haunches of the pipe and brought up simultaneously on both sides so as to obviate any displacement of the pipe from its true alignment.
4. Backfill shall be observed and inspected by the Geotechnical Engineer during placement. . Backfill not compacted in accordance with these specifications shall be recompacted, or removed as necessary and replaced to meet specified requirements prior to proceeding with the work.
5. Perimeter Trench Crushed aggregate base shall be overfilled in trench a minimum of 6” and

rolled utilizing large rollers. Additional perimeter trench stone shall then be removed as required to install planarity leveling stone.

6. Where unacceptable settlements occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation.

D. Placement of Crushed aggregate permeable base:

1. Crushed aggregate permeable base material shall be placed with adequate moisture content to prevent segregation of the particles during grading. Excess water shall not be applied during installation of rock base and rough grading due to the potential of softening the subgrade and altering the grading.
2. Contractor to refer to compaction requirements as outlined in section 1.3 above.
3. Care shall be taken during placement and compaction of the crushed aggregate permeable base material in order to insure that the separation barrier is not torn punctured.
4. The crushed stone must be laid without damaging the soil subgrade (and the in-field drainage system as applicable).The specified stone or aggregate supplied must conform to the recommended specifications. The finished crushed stone or aggregate base supplied must be stable, unyielding, and permeable.
5. The crushed stone shall be carefully and evenly spread over the subgrade and up both sides of the subdrain trenches to the depth shown on the plans.
6. Crushed stone shall be smoothed and compacted uniformly to design grades by alternating raking, water settling, and rolling operations. Contractor shall be advised not to overwork the stone material, thus modifying its gradation characteristics. Minimal rolling is advisable to achieve design grades and compaction. Only static (absolutely no vibratory rolling of the permeable stone is allowed) rolling is allowed on the permeable stone base.

E. The finished elevations of the crushed aggregate permeable base shall meet all requirements as outlined in sections 1.3 and 1.4 above.

3.7 FIELD BOXES

A. Install field boxes as required for all field appurtenances such as irrigation cool-down heads, quick coupler valves, electric outlets, etc. as specified elsewhere and as detailed.

B. Backfill around field boxes with crushed aggregate permeable base material in lifts not to exceed 6 inches in loose depth and compact backfill using methods approved by the Geotechnical Engineer.

1. Required compaction percentages around field boxes shall match requirements as outlines in section 1.3 above.

3.8 FIELD QUALITY CONTROL

A. Proceed with subsequent work only once test results for previously completed work complies with requirements of section 1.3 and 1.4 above.

B. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace materials to depth required; re-compact and retest until specified compaction is obtained.

C. Areas that exhibit segregation of the crushed aggregate permeable base material shall be removed and replaced with properly moisture conditioned crushed aggregate permeable base material, compacted, and graded to the tolerances noted in this specification.

3.9 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep area free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, contaminated, or where they lose compaction due to subsequent construction operations or weather conditions.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 323113

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Chain-link fences and Gates

B. Related Sections include the following:

1. Section 033000 “Cast-In-Place Concrete”
2. Section 329119 “Landscape Finish Grading”

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of fence and gate assembly.

1. Include plans, elevations, sections, details, and attachments to other work.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:

1. Fabric Height: Per Drawings
2. Steel Wire for Fabric: 9 gauge
   a. Mesh Size: 1”.
   b. Polymer-Coated Fabric: ASTM F 668, Class 1 over zinc-coated steel wire.
      1) Color: As selected by Landscape Architect from manufacturer's full range, according to ASTM F 934.
3. Selvage: Twisted top and knuckled bottom.

2.2 FENCE FRAMEWORK

A. Posts and Rails: ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 or ASTM F 1083 based on the following:

1. Fence Height: As indicated on Drawings
2. Horizontal Framework Members: Intermediate and bottom rails according to ASTM F 1043.
3. Metallic Coating for Steel Framework:
    a. Coatings: Paint to match selected color of chainlink.

2.3 SWING GATES

A. General: ASTM F 900 for gate posts and swing gate types.

1. Gate Leaf Width: As indicated on the Drawings
2. Framework Member Sizes and Strength: as indicated.
3. Color to match selected chainlink fabric.

B. Pipe and Tubing:

1. Zinc-Coated Steel: ASTM F 1043 and ASTM F 1083; protective coating, manufacturer's standard protective coating and finish. Color to match selected chainlink fabric.
2. Gate Posts: Round tubular steel.
3. Gate Frames and Bracing: Round tubular steel.
4. Color to match selected chainlink fabric.

C. Frame Corner Construction: assembled with corner fittings.

D. Hardware:

1. Hinges: 180-degree inward swing.
2. Latch: Permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
3. Padlock and Chain: Provide Heavy Duty Security Chain and Lock. With Keys to Owner and Knox Box.
4. Closer: Manufacturer's standard
5. Color to match selected chainlink fabric.

2.4 FITTINGS

A. Provide fittings according to ASTM F 626.

B. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.
    a. Polymer coating over metallic coating.
    b. Color to match selected chainlink fabric.

2.5 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 CHAIN-LINK FENCE INSTALLATION

A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
    a. Concealed Concrete: Place top of concrete 2 inches below grade to allow covering with surface material.

D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 30 degrees or more.

E. Line Posts: Space line posts uniformly according to Drawings.

F. Chain-Link Fabric: Apply fabric to inside of enclosing framework. Leave 1-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut

and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

3.4 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

END OF SECTION 323113

SECTION 323300

SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Manufactured Products:

1. Spectator Seating
2. Drinking Fountains
3. Waste Receptacles
4. Benches
5. Adirondack Chairs
6. Bike Racks
7. Removable Bollards
8. Parking Lot Bollards
9. Small Pedestal Grills
10. Large Countertop Grills
11. Small Countertop Grills
12. Sinks
13. Basketball Assembly
14. Tennis/Pickleball Net
15. Volleyball Posts
16. Storage Shed

B. Related Sections:

1. Section 033000 “Cast-In-Place Concrete”
2. Section 033300 “Architectural Concrete”
3. Section 123640 “Stone Countertops”
4. Section 061063 “Exterior Carpentry”

1.3 SUBMITTALS

A. Product Data: Provide one of each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details.

B. Product Samples: Provide samples of factory-applied finishes.

C. Custom Element Shop Drawings:

1. Provide shop drawings for all custom elements prior to constructing. Drawings must indicate all materials, welds and mechanical connections, hardware, and dimensions.
2. The review and approval of shop drawings by Owner's Representative does not relieve the Contractor of responsibility to ensure that all detailing and workmanship meet the design intent of the Construction Drawings.
3. Shop drawings shall indicate mock up areas. In some cases mock ups may precede or be concurrent with shop drawing production and review.

D. Custom Element Material Samples:

1. Paints
2. Woods
3. Stains and sealants
4. Metal finishes
5. Hardware

E. Material Certificates: For site furnishings, signed by manufacturers.

1. Wood Preservative Treatment: Include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
2. Sustainably Harvested Wood: Include certification by manufacturer and from sources that participate in sustained yield programs.

F. Maintenance Data: For site furnishings to include in maintenance manuals.

1.4 WARRANTY

A. Contractor shall enforce all manufacturers' warranties.

1.5 QUALITY ASSURANCE

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

1.6 MAINTENANCE

A. Maintenance Service:

1. General: Immediately remove all stains to materials or surrounding site improvements. Do not use cleaning solvents harmful to site materials. Do not permit cleaning agents to contaminate planted areas.
2. Equipment: Check regularly for loose bolts, ties or guy wires and re-tighten as required.

B. Extra Materials:

1. General: Provide all items necessary to re-tighten, clean up, restore or replace all items as required to ensure continued use of specified products.
2. Painted Finishes: Provide one-quart can of each primer and finish coat for use in touch-up. Clearly label cans with all batch mixture numbers required to duplicate painted finishes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Substitutions: Substituted manufacturers and products shall be submitted with Bid.

B. Products: Provide all products according to the Drawing Materials Schedule – Sheet L1-100.

2.2 MATERIALS

2.3 DELIVERY, STORAGE, AND HANDLING

A. Packaging and Labeling: Furnish materials in manufacturer's unopened, original packaging, bearing original labels showing quantity, description and name of manufacturer. Verify that all materials and components are adequately padded and securely bound in such a manner that no damage occurs to the product during delivery and unloading at the site.

B. Storage: Store products in a manner that will preclude all damages. Damaged materials will be rejected. Remove damaged materials from the job site immediately, and replace at no cost to Owner. Determination of damage shall be the sole authority of the Owner.

C. Handling: Use suitable equipment to locate all site furnishing materials carefully and efficiently. Lift materials using lifting inserts provided by manufacturer.

D. Painted Finishes: Provide non-scratching, non-staining, firmly-bound covering for all shop-painted finishes until installed and accepted.

E. Wood: Protect from all stains.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Locations: Verify that all site furnishings can be installed at locations as shown on Drawings.

B. Conditions: Examine areas and conditions for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Concrete Pads and Footings

1. Layout: Accurately layout all pads and footings as called for in the Drawings.
2. Refer to Section 033000 “Cast-In-Place Concrete”

3.3 INSTALLATION

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

B. Set anchors, sleeves, bolts and fittings in place and pour footings prior to installation of adjacent paving or walls.

C. Unless otherwise indicated, install site furnishings after adjacent landscape and paving have been completed.

D. Install site and street furnishings level, plumb, true, and securely anchored and positioned at locations indicated on Drawings.

E. Provide quantities and at locations designated in the field.

F. Paint all anchor bolts and tie downs to match furniture.

3.4 CLEANING

A. After completing site and street furnishing installation, inspect components. Remove spots, labels, stickers, dirt, and debris from all site furniture.

B. Repair damaged finishes to match original finish or replace site furniture.

END OF SECTION 323300

SECTION 328400

IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. The CONTRACTOR shall provide all labor, materials, supplies, tools, and transportation and perform all operations in connection with and reasonably incidental to complete the installation of the automatic sprinkler irrigation systems as shown on the drawings. Items hereinafter are included as an aid to take off, and are not necessarily a complete list of work items.

1. Keep existing valves operational as required.
2. Relocate and adjust existing sprinkler heads to achieve and maintain head to head coverage as required.
3. Trenching, stockpiling, excavation, materials, and refilling trenches.
4. Furnishing materials and installation for complete system including piping, valves, fittings, sprinkler heads, dripline and fittings, automatic controls, and final adjustment of heads to insure complete coverage.
5. Line voltage connections to the irrigation controllers and low voltage control wiring from controllers to remote control valves.
6. Replacement of unsatisfactory materials.
7. Re-sod or seed all irrigation trenches through existing sod areas.
8. Clean-up, inspection and approval.
9. All work of every description mentioned in the specification and/or addenda thereto, all other labor, and materials reasonably incidental to the satisfactory completion of the work, including clean-up of the site, as directed by the Project Representative.
10. Tests.
11. As-built record drawings.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Irrigation System:

1. Measurement: Irrigation system installation is measured on a lump sum basis.
2. Payment: The contract lump sum price paid for the Irrigation System shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing the Irrigation System, complete in place.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer catalog information on all material to be used on the project as specified on the legend, notes, details and plans. Redline or highlight exact items on page to be submitted. Complete material list shall be submitted prior to performing any work.

B. Substitutions: No substitution will be permitted without prior written approval by the Project Representative. If the product is approved and, in the opinion of the Project Representative, the substituted product does not perform as well as the specified product, the Contractor shall replace it with the specified product at no additional cost to the Project Representative.

C. All equipment or materials installed or furnished without prior approval of the Project Representative may be rejected and the Contractor may be required to remove the equipment or material at their own expense.

1.4 CLOSEOUT SUBMITTALS

A. Project As-built Record Documents:

1. The Contractor shall maintain in good order in the field office, one complete set of black line prints of all sprinkler drawings which form a part of the contract, showing all water lines, electrical, sprinklers, valves, stub-outs. In the event any work is not installed as indicated on the drawings, such work shall be corrected and documented accurately on the working drawings.

2. Dimension from two permanent points of reference, such as building corners, sidewalks, road intersections or monuments, the following items:

    a. Connection to water source

    b. Backflow preventor

    c. Gate valves

    d. Routing of pressurized mainlines and lateral lines

    e. Remote control valves

    f. Quick coupling valves

    g. Flow sensor, master valve, and irrigation controller

3. Deliverables shall be one full size colored hard copy of the contract drawings with redlines and dimensions or a full sized colored scanned PDF version.

B. Controller Chart:

1. Provide one laminated (hermetically sealed between two pieces of 10 mil. plastic) controller chart showing the area covered by controller for each automatic controller supplied at the maximum size controller door will allow. Chart shall be a reduced drawing of the actual "as-built" system. If controller sequence is not legible when the drawing is reduced to door size, the drawing shall be enlarged to a size that is readable and placed folded, in a sealed plastic container, inside the controller door.

2. Controller chart shall be a blackline print with a different color used to show area of coverage for each station. Charts must be completed and approved by the Project Representative prior to final inspection of the irrigation system.

3. Locate all dripline flush valves and dripline indicators on colored plans if the locations differ from design plans.

C. Controller Cloud Based Communication and Flow Sensor installation confirmation:

1. Provide written confirmation that the cloud-based communications are set up and operational between controller(s) and cloud-based server.

2. If controller is a two-wire type controller. Provide confirmation that the controller is communicating with each decoder valve on system and there are no error messages logged on the cloud-based communication system. Provide a printout of information to Landscape Architect or Irrigation Consultant.

3. Provide written confirmation from the distributor/manufacturer's representative that the controller is communicating with flow sensors and that the correct "k" and "offsets" are setup and utilized properly. The “k” and “offsets” are pre-set numbers you plug into the controller software based on the flow sensor size and type when calibrating the flow sensor. Confirm that flow values have been "learned" and recorded for each valve on the controller, and the correct gpm per valve is shown and verified on a printout and provided to Landscape Architect or Irrigation Consultant. Flow alarms and automatic shut offs should be set up after plant establishment.

D. Maintenance and Operating Instructions and Manuals:

1. Schedule a meeting which includes representatives of the irrigation controller manufacture, the maintenance contractor, the owner, and the irrigation contractor at the site for instruction on the proper programming and operation of the irrigation controller.

2. Contractor shall prepare an Operation and Maintenance Manual, organized in a 3-ring binder, containing the following information.

   a. Contractor's name, address, and telephone number. Duration of guarantee, periods as specified herein, list of equipment with names and addresses of local manufacturer’s representatives with duration of written warranties. Complete operating and maintenance instructions on all equipment spare parts lists and related manufacturer's information.

3. Submit the Operation and Maintenance Manual to the Project Representative within 10 Calendar Days of completion of work of this Section and as a condition of project acceptance.

E. Irrigation Audit, Irrigation Survey, and Irrigation Water Use Analysis:

1. All landscape irrigation audits shall be conducted by a local agency landscape irrigation auditor or a third party certified landscape irrigation auditor. Landscape audits shall not be conducted by the person who design the landscape or installed landscape.

1.5 QUALITY ASSURANCE & GENERAL REQUIREMENTS

A. Qualifications: The Contractor, personally or through an authorized and competent representative, shall supervise the work constantly, and shall as far as possible keep the same foreman and workmen on the job from commencement to completion. The workmanship of the entire job must in every way be first class, and only experienced and competent workmen will be allowed on the job. A minimum of five years' experience of installing irrigation systems of similar scope, size and complexity as the system being installed under this scope of work is required for all on-site job superintendents.

B. Manufacturer's installation instructions and best practices: Manufacturer's installation instructions shall be followed in all cases when not shown in the Drawings or Specifications.

C. O.S.H.A. Compliance: All articles and services covered by this specification shall 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. All materials supplied for this Project shall be new and free from any defects. All defective materials shall be replaced immediately at no additional cost to County.

E. Codes and Standards: Comply with all applicable codes and standards.

1. All work and materials shall be in full accordance with the latest rules and regulations of the National Electric Code; published by the Western Plumbing Officials Association; California Code of Regulations, Title 23, Division 2. Department of Water Resources, Chapter 2.7. Model Water Efficient Landscape Ordinance; and other State or local laws regulations. Nothing in these drawings or specifications is to be construed as 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 shall take precedence over the requirements of said rules and regulations.

3. Contractor shall furnish, without extra charge, any additional material and labor when required by the compliance with these rules and regulations, though the work be not mentioned in these particular specifications or shown on the drawings.

4. The Contractor shall erect and maintain barricades, guards, warning signs, and lights as necessary or required by O.S.H.A. regulations for the protection of the public or workmen.

5. Any existing buildings, equipment, piping, pipe covering sewers, etc., damaged by the Contractor during the course of his work shall be replaced or repaired by the Contractor in a manner satisfactory to the Project Representative and at Contractor's own expense, before final payment is made. The Contractor shall be responsible for damage caused by leaks in the piping systems being installed or having been installed under this contract. He/she shall repair, at his/her own expense, all damage so caused, in a manner satisfactory to the Project Representative.

6. The Contractor shall secure the required licenses and permits including payments of charges and fees, give required notices to public authorities, verify permits secured or arrangements made by others affecting the Work of this section.

1.6 EXISTING CONDITIONS

A. Protection of Existing Structures and Utilities

1. The Drawings show, if applicable, existing above and below grade structures and utilities that are known to the Project Representative. Locate known existing installations before proceeding with construction operations that may cause damage to such installations. Existing installations shall be kept in service where possible and damage to them shall be repaired with no adjustment of Contract Sum. Verify with Project Representative if As Built drawings are available.

2. If other structures or utilities are encountered, request Project Representative to provide direction on how to proceed with the Work. If a structure or utility is damaged, take appropriate action to ensure the safety of persons and property.

B. Trench Interference with Existing Tree Root Systems: Prior to trenching, layout main and lateral line locations within drip Line of trees and review locations with Project Representative. Relocate any lines that may interfere with existing root systems to avoid or reduce damage to root systems as accepted by Project Representative.

C. Provide barricades, coverings, warning signs, lights and other protection required by local code or OSHA to prevent damage to existing improvements to remain and to protect the public.

1.7 DELIVERY, STORAGE AND HANDLING:

A. Protection: Use all means necessary to protect irrigation system materials before, during and after installation and the installed work and materials of all other trades.

B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the satisfaction of the Project Representative and at no additional cost to the project.

1. Exercise care in handling, loading, unloading and storing plastic pipe and fittings under cover until ready to install; transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load. Protect pipe from sunlight.

2. Repair all dented and damaged pipe by cutting out the dented or damaged section and rejoining with a coupling.

1.8 LAYOUT OF WORK

A. The Contractor shall stake out the irrigation system as shown on the drawings. These areas shall be checked by the Contractor and Project Representative before construction is started. Any changes, deletions or additions shall be determined at this check.

B. Due to the scale of the Drawings, it is not possible to indicate all piping offsets, fittings, sleeves, etc., which may be required. Carefully investigate the conditions affected all of the

work and plan accordingly, and furnish all required fittings. Install system in such a manner to avoid conflicts with planting, utilities and architectural features.

C. Do not install the irrigation system as shown on the Drawings when it is obvious in the field that obstructions, grade differences or discrepancies in arc dimensions exist that might not have been considered. Bring such obstruction or differences to the attention of the Project Representative. Notify and coordinate irrigation Work with applicable contractors for location and installation of piping and sleeves through or under walls, pavement and structures. In the event this notification is not given, the Contractor shall assume full responsibility for any revision necessary.

1.9 SEQUENCING AND SCHEDULING

A. Acceptance: Do not install main line trenching prior to acceptance by Project Representative of rough grades completed under another Section.

B. Coordination: Coordinate with the all other trades the sleeving, power requirements of the project, prior to the start of construction.

1.10 INSTRUCTION

A. After the system has been installed and approved, the Contractor shall instruct the Project Representative and or Maintenance Contractor, in complete operation and maintenance of the irrigation system.

PART 2 - MATERIALS

2.1 PIPE AND FITTINGS

A. All pipe shall be manufactured from purple-colored PVC material and shall be printed on two sides with the wording “CAUTION – RECYCLED WATER ".

B. PVC Pressure Mainline pipe and fittings.

1. Pressure mainline piping:

a. **4” AND LARGER**: Shall be polyvinylchloride (PVC) 1120-Class 200 SDR 21, with rubber gasketed bell connections;

b. **3” AND SMALLER**: Shall be PVC 1120-Schedule 40 plastic pipe. Pipe shall be made from NSF approved Type 1, Grade 1 PVC compound conforming to ASTM D1785.

2. Class 200 Pipe shall be made from an NSF approved Type 1, Grade 1 PVC with a cell classification of 12454 per ASTM D1784.

3. Schedule 40 pipe shall be manufactured in strict compliance to ASTM D1785 and D2665 (where applicable), consistently meeting and/or exceeding the Quality Assurance test requirements of these standards with regard to material, workmanship, burst pressure, flattening, and extrusion quality.

4. All PVC pipe shall bear the following markings:

a. Manufacturer’s name

b. Nominal pipe size

c. Class or Schedule

d. Pressure rating in PSI

e. NSF

f. Date of extrusion

5. Use rubber-gasketed pipe equipped with factory installed reinforced gaskets for mainline pipe with a nominal diameter greater than or equal to 4-inches. Gasketed pipe joints must conform to the "Laboratory Qualifying Tests" section of ASTM D3139. Gasket material must conform to ASTM F477. Use rubber gasketed deep bell ductile iron fittings conforming to ASTM A-536 and ASTM F- 477. Use lubricant approved by the pipe manufacturer. 40.6 11/6/02. Ring-tite main line:

6. Use solvent weld pipe for mainline pipe with a nominal diameter less than 3-inches or where a pipe connection occurs in a sleeve. Use Schedule 40 80, Type 1, PVC solvent weld fittings conforming to ASTM Standards D2466 D2467 and D1784 at changes in direction or branch mains. Use primer approved by the pipe manufacturer. Solvent cement to conform to ASTM Standard D2564.

7. Connections between main lines and RCV's shall be of Schedule 80 PVC (threaded both ends) nipples and fittings.

8. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable I.P.D. schedule and NSF Seal of approval.

9. Inside diameter of pipe shall be the same size as iron pipe.

10. PVC Type I shall not be threaded.

11. PVC fittings shall be PVC Type II, Schedule 40 NSF approved.

12. Caution shall be utilized in handling Type I pipe due to the possibility of cracking or splitting.

13. When connection is plastic to metal, male adapters shall be used unless otherwise noted or detailed. The Male adapter shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be non-lead base (Teflon paste or equal).

14. Threaded Nipples – ASTM D2464, Schedule 80 with molded threads.

C. PVC Non-pressure lateral line and fittings

1. Lateral lines (non-pressure): 3/4" and larger shall be Schedule 40 PVC plastic pipe.

2. Manufactured from virgin polyvinyl chloride (PVC) compound in accordance with ASTM D2241 and ASTM D1784; cell classification 12245-B, Type 1, Grade 1.

3. Fittings – All lateral lines shall be connected with Schedule 40, Type I, Grade I, PVC solvent weld fittings.

4. Threads – Injection molded type (where required).

5. Tees and ells – Side gated.

6. Threaded Nipples – ASTM D2464, Schedule 80 with molded threads.

7. Refer to “trenching and backfilling” elsewhere in these specifications for minimum depths.

D. Solvent for all PVC pipe shall be #711 Gray, along with #P-70 primer, NSF approved as manufactured by Industrial Polychemical Service, Gardena, California, or approved equal.

E. Pipe joint compound shall be non-hardening, non-toxic materials designed specifically for use on threaded connections in water carrying pipe. Performance shall be same as RectorSeal #5.

F. PVC Flexible Pipe: Extruded from flexible vinyl chloride compound.

1. ½ inch pipe: 0.50 inch inside diameter, 0.090 inch wall thickness

2. Material shall conform to ASTM designation D-2287.

G. Swing joints shall be as shown on construction details.

2.2 SLEEVES

A. Sleeve below all hardscape elements with SCH 40 or Class 200 PVC twice the diameter of the pipe or wire bundle within, or as delineated on the plans.

B. Under Hardscape Crossings: Sleeves shall extend a minimum of 24 inches beyond all sidewalks, or shall be extend 24” beyond the back edge of the curb, where noted on the plans.

2.3 BACKFLOW PREVENTION DEVICE

A. Backflow prevention device shall be the reduced pressure type with gate valves, check valves, test cocks, reduced pressure chamber and air vent.

B. Provide a freeze preventative blanket around backflow assembly. Blanket shall be green.

C. All metallic pipe and fittings installed below grade shall be wrapped with an approved asphaltic tape.

D. Backflow prevention device model and size shall be as shown on the drawings.

2.4 BACKFLOW PREVENTION DEVICE ENCLOSURE

A. Enclosure shall be sized to completely enclose backflow device.

B. Install enclosure device as detailed.

2.5 MASTER CONTROL VALVE

A. Master control valve shall be a normally open 24 VAC solenoid actuated globe pattern valve.

B. Valves shall be made of cast iron with a minimum pressure rating of 150 PSI

C. Valve shall have external and internal bleed for manual operation.

D. Valve model and size shall be as shown on drawings.

2.6 FLOW SENSORS

A. Inline flow sensors shall be installed in accordance with the manufacturer's installation instructions. Contractor is responsible for the installation, all required materials and connections of the flow sensors for complete operation with the irrigation controller.

B. Flow sensor size and model shall be listed on the drawings.

2.7 DUCTILE IRON FITTINGS

A. Fittings shall be deep bell push-on joint fittings manufactured for ASTM A536, Grade 65-45-12 ductile iron with a tensile strength of 65,000 psi.

B. Fittings shall be designed for use on IPS PVC pipe.

2.8 DUCTILE IRON FITTING ENCASEMENT:

A. Encase all ductile iron fittings and gate valves with a 4-Mil high density, cross laminated (HDCL) polyethylene plastic sheeting (AWWA C105). Wrap and fold around fittings to prevent contact with soil.

2.9 JOINT RESISTANT HARNESS

A. Use a joint restraint harness wherever joints are not positively restrained by flanged fittings, threaded fittings, and/or thrust blocks.

B. Use a joint restraint harness with transition fittings between metal and PVC pipe, where weak trench banks do not allow the use of thrust blocks, or where extra support is required to retain a fitting or joint.

C. Use bolts, nuts, retaining clamps, all-thread, or other joint restraint harness materials which are zinc plated or galvanized.

D. Use on pipe greater than or equal to 3-inch diameter or any diameter rubber gasketed pipe.

2.10 GATE VALVES

A. Gate valves 3" and smaller shall meet the following requirements:

1. Valves shall be of stainless steel (304 or higher) or bronze/brass construction with non-rising stem, cross handle and threaded connections.
2. Valves shall be Leemco Model #LGT-SS, Nibco T-113-K or approved equal. Size as shown on the drawings
3. Install in 10" diameter plastic valve box as detailed.

B. Gate valves 4" and larger shall meet the following requirements:

1. Valves shall be cast iron with operating nut (2" square) with a D.I. flanged end, MJ or "O" ring connection for Class 200 PVC plastic pipe. Refer to irrigation legend and details for model number and connection type.
2. Install in 10" diameter plastic valve box as detailed.

2.11 QUICK COUPLING VALVES

A. Quick coupling valves shall be as shown on the drawings.

B. Install in 10” diameter plastic valve box as detailed.

2.12 CONTROLLERS

A. Controller’s size and model shall be as listed on the drawings.

B. Final location(s) of controller shall be approved by the Project Representative.

C. Controller requires 120v power. Maximum power output of controller is 2.5 amps.

D. Install Controller and accessories as detailed and per Manufacturer’s details.

2.13 BOOSTER PUMP

A. Booster pump shall be as shown on the drawings.

A. Install as detailed.

2.14 TWO WIRE CABLE

A. Irrigation control wires: solid copper with U.L. approval for direct burial in ground. Size #14awg wire with a jacketed 2-conductor. Preferred wire make and model is the Paige irrigation wire or approved equal. All splicing shall be made with 3-M DBR/Y-6.

B. Two wire cable shall be installed within 1¼” Schedule 40 grey PVC with Schedule 40 fittings and Schedule 40 electrical long sweeps elbows at all changes in direction. Pull boxes shall be located a maximum of 250 feet on center, adjacent to controller, and at each change of direction.

2.15 CONDUIT PULL BOXES

A. In Landscaped Areas: Conduit pull boxes shall be Carson Model 1419, or approved equal plastic valve box with a lockable plastic lid. Color shall be Gray and lockable. Heat brand box “PB”. Text height of letters to be 2”.

B. Pull boxes along a long conduit run shall be no more than 250 feet apart.

C. Each pull box shall be set on 6 inches, minimum, of clean drain rock.

D. Pull boxes shall be placed at all angle points in conduit runs.

2.16 ELECTRIC REMOTE CONTROL VALVES

A. Electric remote control valves sizes shall be shown on drawings.

B. Electric remote control valve shall be a normally closed 24 VAC solenoid actuated globe pattern valve.

C. Valves shall be made of durable glass-filled nylon, brass or cast iron with a minimum pressure rating of 150 PSI

D. Valve shall have external and internal bleed for manual operation.

E. Where shown on details, all valves shall have one Schedule 80 PVC FIPT threaded true union ball valve with EPDM O-rings on the upstream side of valve and one Schedule 80 union on the downstream side of valve. Ball valve shall be IPEX VXE series, Asahi Type 21 or equal. Match valve size when sizing ball valve and union.

F. All valves that service dripline or drip systems shall include a plastic wye filter and pressure regulator on the valve or a solid set 40 PSI plastic regulator downstream of the valve. Filters shall be rated to 120 psi, includes a 150 mesh disk or stainless steel screen.

2.17 IDENTIFICATION TAG

A. Identification tags for all electric control valves shall be manufactured by Christy approved equal.. Tag numbers shall match stationing in controller and as shown on as-built drawings. Provide one yellow station number tag for each electric control valve as follows:

1. Potable water systems: Christy ID.STD.Y1 or approved equal.

2.18 VALVES BOXES

A. ELECTRIC REMOTE CONTROL VALVE BOXES:

1. All electric remote control valve boxes that service non-drip systems shall be installed within a Carson model 1419 (14”x19”) or 1220 (13” x 20”) plastic valve box with bolt down plastic lid or approved equal. Size of box is dependent on the size of valve. Lid shall be marked: "Irrigation Control Valve."

2. All electric remote control valve boxes that service dripline or drip systems shall be installed within a Carson model 1220 plastic valve box approved equal, with bolt down plastic lid or approved equal. Lid shall be marked: "Irrigation Control Valve."

3. Use black colored boxes in shrub and groundcover areas and green in turf areas.

4. Heat brand controller letter and numbers into lid. Minimum text height to be 2”.

B. GATE VALVE AND QUICK COUPLING VALVE BOXES:

1. All gate valve and quick coupling valve shall be installed within a Carson Model 910-18” depth plastic valve box with plastic lid or approved equal. Use 8” or 10” sleeve to encase gate valve.

2. Use black colored boxes in shrub and groundcover areas and green in turf areas.

3. Heat brand the letters “GV” into lid. Minimum text height to be 2”.

C. DRIP COMPONENT BOXES:

1. All drip components shall be installed within a 6” round black plastic valve box with plastic lid. Carson Model 708 plastic valve box with plastic lid or approved

2.19 SPRINKLER HEADS

A. All sprinkler heads shall be as listed on the drawings.

B. Pop-up spray sprinklers shall include a built in check valve in the body to hold up to 14 feet of head.

C. Pop-up spray sprinklers shall include built in pressure regulation in the body.

D. Use 30 psi regulators for all spray nozzles and 45 psi regulators for all rotating nozzles. Use 12” pop-ups in shrub and ground cover areas and 6” pop-ups in turf areas.

E. Riser units and nipples shall be the same size as the inlet to the sprinkler body.

2.20 BUBBLERS

A. Bubblers shall be as listed on the drawings.

B. Bubblers shall be pressure compensating from 20 psi to 60 psi.

C. The bubbler body shall be manufactured with UV Stabilizers and have ½” FIPT threads for connection to ½” MNPT male adaptor or nipple.

D. Flow rate molded onto the bubbler for easy identification

E. Where low head drainage occurs, each bubbler shall have a check valve installed. Hunter HC-50F-50M or approved equal.

2.21 DRIPLINE & DRIPLINE COMPONENTS

A. Dripline shall be as listed on the drawings.

B. Tubing shall be low density, UV resistant, polyethylene tubing with internal pressure-compensating, drip emitters impregnated into the tubing spaced at 12 or 18 inches

C. The built in emitters shall be capable of delivering 0.6gallons per hour per emitter.

D. All dripline systems shall have a manual flush valve at each isolated zone within the systems. Multiple flush valves may be required per drip zone.

E. All dripline systems shall have air relief valve(s) at the highest elevation point(s) within each isolated zone. Install one air relief valve for every 500 linear feet of dripline.

2.22 CHECK VALVE

A. Spring check valve shall be Schedule 40 PVC with ½ lb spring and stem rated at 150 PSI.

B. Check valves shall be NDS. Use KSC series swing check valve for all uphill flow direction valves and KC series spring check for all downhill flow direction valves. Size per line size of lateral line.

2.23 MISCELLANEOUS INSTALLATION MATERIALS

A. Solvent cement and primer for solvent weld joints shall be of make and type approved by manufacturer(s) of pipe and fittings. Cement shall be maintained at proper consistency throughout use.

B. Lubricant for assembling rubber ring seal joints shall be of make and type approved by manufacturer of pipe.

C. Pipe joint compound shall be non-hardening, non-toxic materials designed specifically for use on threaded connections in water carrying pipe. Performance shall be same as RectorSeal #5.

2.24 MISCELLANEOUS EQUIPMENT

A. Provide all equipment called for by the drawings.

B. Provide to the Project Representative at completion of the maintenance period, three (3) each of all operating and servicing keys and wrenches required for complete maintenance and operation of all heads and valve. Include all wrenches necessary for complete disassembly of all heads and valves.

PART 3 - INSTALLATION

3.1 PREPARATION

A. Schedule and coordinate placement of materials and equipment in a manner to effect the earliest completion of work in conformance with construction and progress schedule.

3.2 HANDLING AND STORAGE

A. Protect work and materials from damage during construction and storage as directed by the Project Representative.

B. Handle plastic pipe carefully; especially protect it from prolonged exposure to sunlight. Any section of pipe that has been damaged will be discarded and removed and replaced if installed.

3.3 LAYOUT

A. Lay out work as accurately as possible in accordance with diagrammatic drawings.

B. Where site conditions do not permit location of piping, valves and heads where shown, notify Project Representative immediately and determine relocation in joint conference.

C. Prior to installation, the Contractor shall stake out the routing of all pressurized main lines and sprinkler heads for approval by Project Representative.

D. Run pipelines and automatic control wiring in common trenches wherever practical.

3.4 EXCAVATING AND TRENCHING

A. Work shall be performed when soils are reasonably dry and not saturated.

B. Trenching

1. Excavations shall be open vertical construction sufficiently wide to provide free working space around the work installed and to provide ample space for backfilling and compacting.

2. In existing turf areas remove sod with sod cutter. Roll and set aside. Replace immediately after installing conduit (three days maximum), backfilling and compacting.

3. Depth of trenches shall be pipelines deep enough to provide minimum cover from finish grade as follows.

   a. 24” or 18” minimum cover over main lines to control valves and quick coupling valves. Refer to legend for depth requirements.

   b. 24” or 18” minimum cover over control wires from controller to valves. Refer to legend for depth requirements.

   c. 12” minimum cover over RCV controlled lateral lines to sprinkler heads. 18” depth will be required at all 12” pop-up sprinklers. Refer to legend for depth requirements.

4. Trenches shall be excavated to such depths as will permit the pipe to be laid at the elevations, slopes, or depths of cover indicated on the drawings, and at uniform slopes between indicated elevations.

5. Whenever cobbles larger than 2 inches in size are present in earthen subgrade, the trench section shall be excavated to the lines required. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated. Trenches shall be excavated with approximately vertical sides between the elevation of the bottom of the pipe and an elevation one foot above the top of the pipe.

6. When two pipes are to be placed in the same trench, maintain a six-inch space between pipes as minimum.

7. Where other utilities interfere with irrigation trenching and pipe work, adjust the trench depth as instructed by the Project Representative.

8. Restore surfaces, existing underground installations, etc., damaged or cut as a result of excavations, to original conditions in a manner approved by the Project Representative.

C. Backfilling:

1. Backfill materials shall be approved native soil in all landscaped areas. Unsuitable material, including clods and rocks over 2inches in size shall be removed from the premises by Contractor and disposed of legally at no cost to the Project Representative.

2. Backfill only after piping has been tested, inspected and approved.

3. Place backfill materials in 6” layers and compact by tamping to a minimum compaction of 90 percent of original soil density.

4. Dress off areas to finish grades and remove excess soil, rocks or debris remaining after backfill is completed.

5. All backfilling shall be properly compacted so as to avoid future settlement.

6. If settlement occurs along trenches, and adjustments in pipes, valves and sprinkler heads, soil, sod or paving are necessary to bring the system, soil, sod or pav-

ing to the proper level or the permanent grade, the Contractor, as part of the work under this contract, shall make all adjustments without extra cost to the project.

3.5 INSTALLATION OF SLEEVING UNDER ASPHALT OR CONCRETE

A. General: Layout of the piping system shall be per the drawings and to the depth specified above.

B. Under Existing Pavement:

1. Piping under existing pavement may be installed by jacking, boring or hydraulic driving, except that no hydraulic driving will be permitted under asphaltic concrete pavement.

2. Where cutting of existing pavement is necessary, provide alternate routes for vehicular traffic. After placement of pipes, backfill trench and compact to 95%. Replace entire section of base rock and hardscape to match existing conditions.

C. Inspection of Pipe and Fittings: Carefully inspect all pipe fittings before installation, removing all dirt, scale and burrs; ream as required. Install all pipe with all markings up for visual inspection and verification.

D. Installation of Sleeving:

1. Sleeving shall be installed a minimum of 24 inches below grade.

2. Sleeving shall extend 24 inches beyond the edge of finished concrete surface.

3. Trenches containing sleeves shall be backfilled with material that consists of unwashed creek or bank gravel, crushed grave, crushed rock, sand or a mixture of these materials. If must be free from roots, vegetable matter or other deleterious substance and shall be of such nature and so graded that it will bind readily when watered and compacted. Backfill with such material to the bottom of the concrete or hardscape section and compacted to a minimum of 90%. Where the sleeve extends beyond the edge of the hardscape or concrete, the sleeve shall be backfilled with native soil or imported topsoil, which ever is specified. If nothing is specified, use previously excavated native soil.

4. Prior to placement of concrete, the ends of the sleeves shall be marked with a stake that shall be exposed approximately 2”-3” above rough, or finished grade to identify sleeve locations. On all street crossing, the location shall be marked at the edge of concrete or hardscape with a chiseled line or “x”, and the stake removed.

3.6 ASSEMBLING PIPELINES

A. PVC pipe shall be installed in a manner which will provide for expansion and contraction as recommended by the pipe manufacturer. Pipe routing is diagrammatic and shall be installed in such a manner as to conform with the details.

B. In joining, use only the specified solvent and make all joints in strict accordance with the manufacturer's recommended methods. Give solvent welds at least 16 minutes set-up time before moving or handling and 24 hours curing time before filling with water.

C. All pipe shall be assembled free from dirt and pipe scale. Field cut ends shall be reamed only to full pipe diameter with rough edges and burrs removed.

D. Install 3” wide detectable warning tape above all pressurized main lines as shown in the details. Use Christy model #TA-DT-3-BIRR or approved equal for potable irrigation systems.

E. Rubber Ring Seal Joint:

1. Use factory made male end or prepare field-cut male end to exact specifications of factory made end.

2. Carefully clean bell or coupling and insert rubber ring without lubricant. Position ring carefully according to manufacturer’s instructions.

3. Lubricate male end according to manufacturer’s instruction and insert male end to specified depth. Use hands only when inserting PVC pipe.

4. Thrust blocks shall be provided where necessary to resist system pressure on ring-tite pipe and fittings. Blocks shall be concrete and the size shall be based on an average soil safe bearing load of 700# per square foot.

5. Form thrust blocks in such a manner that concrete comes in contact only with the fittings. Thrust blocks shall be between solid soil and the fittings.

6. Ductile Iron Fittings Encasement: Wrap valves, tees, elbows, etc. with a flat sheet or split length of polyethylene tube by passing the sheet under and then over the appurtenance and bringing it together around the body of the appurtenance. Make seams by bringing the edges of the polyethylene together, folding over twice and taping them down. Carefully pour thrust blocks so as not to damage polyethylene material.

F. Solvent Weld Joint:

1. Prepare joint by first making sure the pipe end is square. Then, de-burring the pipe end, and clean pipe and fitting of dirt, dust and moisture.

2. Dry insert pipe into fitting to check for proper sizing. Pipe should enter fitting 1/3 to 2/3 depth of socket.

3. Coat the inside socket surface of the fitting and the male end of the pipe with P-70 primer (manufactured by Weld-On). Then without delay, apply Weld-On 711 cement liberally to the male end of the pipe and also apply 711 cement lightly to the inside of the socket. At this time, apply a second coat of cement to the pipe end.

4. Insert pipe immediately into fitting and turn 1/4 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. Pipe and fitting shall be aligned properly without strain to either.

5. Hold joint still for approximately thirty (30) seconds and then wipe the excess cement from the pipe and fitting.

6. Cure joint a minimum of thirty (30) minutes before handling, at least six (6) hours before allowing water in the pipe.

G. Threaded Joint:

1. Field threading of plastic pipe or fittings is not permitted. Only factory formed threads will be permitted.

2. Factory made nipples shall be used wherever possible. Field cut threads in metallic pipe will be permitted only where absolutely necessary. When field threading, cut threads accurately on axis with sharp dies.

3. All threaded joints shall be made up with pipe joint compound. Apply compound to male threads only.

4. Where assembling metallic pipe to metallic fitting or valve, not more than three (3) full threads shall show when joint is made up.

5. Where assembling to threaded plastic fitting, take up joint no more than one full turn beyond hand tight.

6. Where assembling plastic pipe, use strap type friction wrench only; do not use metal-jawed wrench.

H. Cap or plug openings as pipeline is assembled to prevent entrance of dirt or obstructions. Remove caps or plugs only when necessary to continue assembly.

I. Where pipes or control wires pass through sleeves, provide removable non-decaying plug at ends of sleeve to prevent entrance of earth.

J. For plastic-to-steel connections, work the steel connections first; use a non-hardening non-lead base pipe dope on all threaded plastic-to-steel connections and use only light wrench pressure. All plastic-to-steel connections shall be made with SCH 80 PVC nipple or plastic male adapters.

3.7 REMOTE CONTROL VALVES

A. Install where shown on drawings and group together where practical. Limit one remote control valve per box.

B. Locate valve boxes 12” from and perpendicular to walk edges, buildings and walls. Provide 12” between valve boxes where valves are grouped together.

C. Thoroughly flush main line before installing valves.

D. Install in shrub or groundcover areas where possible.

E. Label control line wire at each valve with an I.D. tag, indicating identification number of valve (controller and station number). Attach label to control wire.

F. Flow control stems shall be adjusted or tuned per manufacturer recommendations.

G. Install 18GA ½” x ½” square stainless-steel Type 304 wire mesh under all valve boxes and wrap up the sides of the valves. Adhere wire mesh to sides of box with stainless-steel screws and washers as required. Refer to details for more information.

3.8 TWO WIRE CABLE

A. Run lines along mains wherever practical.

B. Loop a minimum of two (2) feet of extra wire in each valve box.

C. Connections shall be made by crimping bare wires with brass connectors and sealing with watertight resin sealer packs per manufacturer specifications.

D. Splicing will be permitted only at valve/decoder connections and at main line tee branches. Do not splice in wire pull boxes. Locate all splices within valve boxes or in a two wire splice box.

E. Where two wire cable passes under paving, they shall pass through Schedule 40 electrical PVC conduit. (NOT REQUIRED IF TWO WIRE IS SPECIFIED IN CONDUIT)

3.9 TWO WIRE CABLE IN CONDUIT:

A. Install cable in PVC electrical conduit with pull/splice boxes located as shown on plans and as required. This conduit shall be dedicated to irrigation control wires only.

B. For all cable runs, pull/junction boxes will be required every 250 linear feet of conduit run.

C. All electrical equipment and wiring shall comply with local and state codes and be installed by personnel skilled and licensed in the trade.

D. Connecting and splicing of wire at the valves shall be made using approved materials and shall be made by crimping bare wires with brass connectors and sealing with watertight resin sealer packs. 3M DBY-6 or approved equal.

E. All splices shall be placed within a valve box. Leave a 24” long coil, at each pull box, or splice location.

3.10 AUTOMATIC CONTROLLER

A. Provide and install automatic irrigation controller in approximate locations shown on drawings. The exact location will be determined on the site by the Project Representative. Provide conduit and wire and connect to 120 volt switch accessible to controller for ease of maintenance.

B. Connect control lines to controller in sequential arrangement according to assigned identification number on valve.

C. Provide each pedestal controller with its own ground rod. Separate the ground rods by a minimum of eight feet. The ground rod shall be an eight foot long by 5/8" diameter U.L. approved copper clad rod or as recommended by controller manufacturer. Install no more than 6" of the ground rod above finish grade. Connect #8 gauge wire with a U.L. approved ground rod clamp to rod and back to ground screw at base of controller with appropriate connector. Make this wire as short as possible, avoiding any kinks or bending. Install a minimum of 8’ away from pedestal housing base unless otherwise noted.

3.11 SPRINKLER HEADS AND BUBBLERS

A. All sprinkler heads shall be set perpendicular to finish grade of the area to be irrigated unless otherwise designated on the plans.

B. In lawn areas, all sprinkler heads shall be offset a minimum of 3 inches and a maximum of 6 inches from the edge of adjacent hardscape.

C. Flush and adjust irrigation outlets, bubblers and nozzles for optimum performance and to prevent overspray onto field, walks, roadways, and/or buildings as much as possible. This shall include selecting the best degree of arc and radius to fit the existing site conditions and throttle the flow control at each valve to obtain the optimum operating pressure for each control zone.

3.12 QUICK COUPLING VALVES

A. Thoroughly flush lines before installing quick coupling valves.

B. Locate quick coupling valves as shown in the drawings and details.

C. Locate valve boxes 12” from and perpendicular to walk edges, buildings and walls. Provide 12” between other valve boxes where valves are grouped together.

3.13 DRIPLINE AND DRIPLINE COMPONENTS

A. Thoroughly flush all driplines.

B. Install dripline a minimum of 12” away from all buildings and 6” off hardscapes for shrubs and groundcover. 2” of paving for all no-mow or sod type grasses.

C. Space driplines equally throughout the planting area as detailed. Refer to legend for emitter and row spacing of dripline. Adjust alternate rows so emitters are spaced in a triangular pattern.

D. All dripline tubing shall be buried 4” below finish grade and stapled down every 4’ and at each change in direction with a 6” tubing stake.

E. For slopes greater than 10:1, modify dripline row spacing on the bottom 1/3 of the slope to be 25% greater at the bottom of the slope.

F. Install flush valves at the low end of each drip zone minimum of 2 valves are required for each valve. Refer to manufacturer details for installation instructions.

G. Install air vacuum relief valve(s) at high point(s) of each planting area. Refer to drawings for approximate locations. Revise locations in field based on actual grades of the site. Locate 1 valve per every 500’ of dripline. Refer to manufacturer details for installation instructions.

H. Thoroughly saturate soil prior to planting. Provide additional surface watering as required to keep plant root systems moist during planting establishment period.

3.14 FIELD QUALITY CONTROL

A. Coverage Tests:

1. Perform coverage tests in the presence of Project Representative, after sprinkler or drip system is completed. Test system to assure that all areas are irrigated completely and uniformly.

2. Do not spray onto pavement or structures. Adjust arc nozzles as needed to provide full coverage without over spray.

B. Adjusting and Cleaning:

1. System adjustment:

a. Valves: Adjust flow for proper operation.

b. Heads: Adjust for alignment and coverage.

c. If it is determined that coverage could be improved by adding additional driplines or a nozzle change, make such changes as required to provide adequate coverage to all plant material.

d. Perform final cleaning of all risers, dripline, heads, and equipment for proper operation. Demonstrate operation and uniform coverage in the presence of the Project Representative prior before final acceptance.

3.15 TESTING

A. General

1. Notify the Project Representative at least three (3) days in advance of testing.

2. Furnish all necessary testing equipment and personnel.

3. Perform testing at his/hers own expense.

4. Correct all leaks and retest until acceptance by the Project Representative.

5. Center load piping with small amount of backfill to prevent arching or slipping under pressure. No fitting shall be covered

B. Closing uninspected work: Do not allow or cause any of the work of this section to be covered up or enclosed until it has been inspected, tested and approved by the Project Representative and other authorized agencies.

C. Flushing: Before backfilling the main line, and with all control valves in place but before lateral pipes are connected, completely flush and test the main line and repair all leaks. Flush out each section of lateral pipe before sprinkler heads are attached.

D. Perform test as specified below. Remake any faulty joints with all new materials. Use of cement or caulking to seal leaks is absolutely prohibited.

E. Pressure Testing Procedure:

1. Apply the following tests after welded plastic pipe joints have cured at least twenty-four (24) hours.

a. Ring-Tite Mainline: Remove all the air from the piping system then test live (constant pressure) and QCV lines hydrostatically at 125 PSI minimum. Lines will be approved if test pressure is maintained for two (2) hours. Maintain pressure during this time period and measure the amount of water required to maintain that test pressure. Approved tables of allowable loss are below, and the line will be approved or not approved as such results may indicate. The Contractor shall make tests and repairs as necessary until test conditions are met.

Allowable leakage for PVC plastic pipe with elastomeric joints in U.S. gallons per hour at a test pressure of 150 PSI.

- 4” - 0.30 gallons per 1000 ft. or 50 joints

- 6” - 0.45 gallons per 1000 ft. or 50 joints

b. Solvent Weld Mainline: Remove all the air from the piping system then test live (constant pressure) and QCV lines hydrostatically at 125 PSI minimum. Lines will be approved if test pressure is maintained for six (6) hours. The lines shall be restored to the original test pressure. The Contractor shall make tests and repairs as necessary until test conditions are met.

c. Test RCV controlled lateral lines with water at line pressure and visually inspect for leaks. Retest after correcting defects.

F. Final Inspection

1. Thoroughly clean, adjust and balance all systems.

2. Demonstrate the entire system to the Irrigation Consultant and/or, if required, authorized agent and other governing agencies providing that all remote control valves are properly balanced, that all heads are properly adjusted for radius and arc of coverage, and that the installed system is workable, clean and sufficient.

3.16 GUARANTEE

A. It shall be the responsibility of the Contractor to fill and repair all depressions and replace all necessary lawn and planting due to the settlement of irrigation trenches for one year following completion and acceptance of the job.

B. The Contractor shall also guarantee all materials, equipment and workmanship furnished by him to be free of all defects of workmanship and materials, and shall agree to replace at his expense, at any time within one year after installation is accepted, any and all defective parts that may be found.

3.17 MAINTENANCE

A. Continuously maintain irrigation system in areas indicated in the Contract during the progress of work and for a period of 90 days after substantial completion.

B. It is Contractor's responsibility to turn over the irrigation in a first-class condition at the end of the maintenance period.

C. Maintenance Schedule: Contractor shall submit schedule of maintenance tasks to be performed for Project Representative review and approval. At a minimum, maintenance staff shall be on-site two times per month. It is not the intention of these Specifications to allow a "quick cleanup" at the end of the maintenance period, but rather that the work be continuous and ongoing.

D. Proper irrigation system maintenance includes the overall supervision of the system, controller scheduling, routine adjustments and necessary repairs.

E. Maintain irrigation system for optimum performance, as per manufacturer’s specifications, by inspecting the entire system on an on-going basis. This includes cleaning and adjusting all bubbler heads, dripline and valves for proper coverage.

3.18 CLEAN-UP

A. Preservation and Cleaning: The Contractor shall clean up the work as it progresses. At frequent intervals, and at all times when directed by the Project Representative, the Contractor shall remove and dispose of accumulations of rubbish and debris of all kinds. At the time of completion, the entire site shall be cleared of tools, equipment, rubbish, etc., all of which shall be removed from the site; and the entire project, including surrounding premises, shall be left in proper, clean condition ready for acceptance.

END OF SECTION 328400

SECTION 329113

SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Provide all soil and soil amendment products, topsoil, manufactured soil mixes and amendments. Execute all labor to achieve soil production, delivery, and placement.

1. Bioretention Soil Mix
2. Topsoil as required based on grading plans. Refer to notes in plans regarding cut/fill requirements.
3. Top Dress Amendments

B. Related Sections:

1. Section 311000 "Site Clearing"
2. Section 312000 "Earthwork"
3. Section 328400 “ Irrigation Systems”
4. Section 329119 “Landscape Finish Grading”
5. Section 329400 “Planting Accessories”

1.2 REFERENCES

A. ASTM — ASTM International: D 1557 — Test method for Laboratory Compaction Characteristic of Soil Using Modified Effort.

B. EPA — Environmental Protection Agency:

1. Method 8015
2. Method 8020
3. Method 3050/3051
4. Method 6010

C. USDA — United States Department of Agriculture:

1. Texture Triangle Classification
2. Handbook No. 60

D. Soil Science Society of America

1. Methods of Soil Analysis, Part 1, Physical and Mineralogical Methods, Soil Science Society of America, Inc., 1986

2. Methods of Soil Analysis, Part 3 Chemical Methods, Soil Science Society of America, Inc 1996.

E. California Department of Pesticide Regulation
1. Qualified Applicator License

1.3 DEFINITIONS

A. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

B. Imported Soil: Soil that is transported to Project site for use.

C. Existing Soil: Area of undisturbed native soil where no rough grading is to be done. No topsoil is to be placed.

D. Surface Soil: Soil that is present at the top layer of the existing soil profile.

E. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

F. Subgrade: Soil level resulting from the rough grading work under another Section. Cultivation of all subgrade areas prior to amending is included in this section.

G. Planting Soil or Planting Soil Mix: Surface horizons of soil in planting areas, and shrub and tree pit backfill. If conforming, sources can include manufactured and/or imported soil mixes, amended or un-amended. Refer to PART 2 for different types.

H. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

I. Finished Grades: The soil surface grade elevations and contours indicated on the Drawings and as defined in Section 329119 “Landscape Finish Grading”

J. Aesthetic Acceptance of Grades: Acceptance by the Landscape Architect in writing of the aesthetic correctness of the contours as observed without a survey instrument. Aesthetic acceptance does not address whether an area drains properly, whether the areas are at the correct elevation, or whether it has been compacted properly. Refer to Finish Grading Section for Tolerances.

K. Excessive Compaction in Designated Planting Areas: Soil Bulk Density shall not exceed 1.6 as measured by the cylindrical core method.

L. Landscape Architect: Landscape Architect employed by the Owner to provide professional landscape architectural services for the Project.

M. USCC: U.S. Composting Council.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer's current catalog cuts and specifications of the following:

1. Fertilizer
2. Soil Conditioners and Amendments
3. PreEmergent Herbicide
4. Filter Fabrics

B. Contractor Qualifications: Preemergent herbicide shall be applied by a DPR-licensed Qualified Applicator Certificate (QAC) or Qualified Applicator License (QAL) holder. Provide qualifications information including name of company and certification or license information.

C. C. Soil Preparation and Seeding Schedule: Submit a schedule for soil preparation and seeding operations indicating the timing of each step

1.5 SOIL QUALITY CONTROL PROGRAM

A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

1. Approved Testing Agencies: Wallace Laboratories, 365 Corel Circle, El Segundo, CA 90245 (310) 615-0116.

2. Waypoint Analytical California, Inc.

3. Or approved equivalent.

B. Testing Program: The Landscape Architect and the Independent Testing Lab will direct and coordinate the soil amendment program.

C. General: Contractor shall coordinate the soils testing, amendment, delivery, and placement process with the Landscape Architect (and document in an amendment schedule) prior to the initiation of soil amendment. Provide soil samples for testing as directed by the Resident Engineer and Landscape Architect.

1. For soils amended in-place develop a program to ensure consistent distribution and blending of amendments. Provide testing and amended soil samples prior to placement and amendment.

D. Testing Costs:

1. Topsoil tests shall be paid by the Contractor.
2. Amendment tests shall be paid by the Contractor.
3. Post Placement and Amendment Testing shall be paid for by the Contractor.

E. Samples and Test Reports shall be required as follows:

1. Existing Topsoils (15 tests as located by the Landscape Architect)
2. Import Topsoil as required (assume a minimum of (3) per 500 CY of import topsoil).
3. Sand, Organic Matter and Amendments (as needed).

F. Rejected Materials: Remove off site at Contractor's cost. Contractor shall be responsible for cost of additional testing resulting from materials being delivered that do not meet Specifications.

G. Existing Topsoil Testing Requirements - Soil Analysis to Verify Chemical and Physical Characteristics shall include the following:

1. Soil Texture: Determine soil texture per commonly used methods.
2. Acidity: pH measurement in the saturation extract per USDA Handbook No. 60, Method 21.
3. Total pore space*
4. Air space at field capacity*
5. Water/moisture holding capacity*
6. Organic Matter: Determine organic matter content based on organic carbon.

H. Import Topsoil Testing Requirements - Soil Analysis to Verify Chemical and Physical Characteristics shall include the following:

1. Soil Texture: Determine soil texture per commonly used methods.
2. Hydraulic Conductivity: USDA Handbook No. 60, Method 34b
3. Acidity: pH measurement in the saturation extract per USDA Handbook No. 60, Method 21.
4. Electrical conductivity of the saturation extract per USDA Handbook No. 60, Method 2.
5. Sodium absorption ratio of the saturation extract per USDA Handbook No. 60, Method 20b.
6. Total pore space*
7. Air space at field capacity*
8. Water/moisture holding capacity*
9. Determination of boron, calcium, copper, iron, magnesium, manganese, molybdenum, phosphorous, potassium, sodium, sulfur, and zinc, via the following test methods: Mehlich Number 3, Bray P1, Bray P2, Olsen P, DTPA, ammonium acetate, ammonium bicarbonate DTPA, and hot water extract from boron.
10. Analysis of saturation extract for calcium, magnesium, sodium, boron, chloride, phosphorous, nitrate, and sulfate.
11. Presence of calcium carbonate and magnesium carbonate.
12. Exchangeable Ammonium cation.
13. Base Saturation.
14. Cation Exchange Capacity.
15. Carbonates Determination.
16. Organic Matter: Determine organic matter content based on organic carbon.
17. Source/Topsoil: Measurement of following trace metals by the DTPA extract: aluminum, arsenic, cadmium, chromium, cobalt, lead, lithium, nickel, selenium, silver, strontium, tin, and vanadium.

I. Bioretention Soil Testing Requirements- Soil Analysis to Verify Chemical and Physical Characteristics shall include the following:

1. Sieve analysis of BSM per ASTM D422 performed within two (2) months of product delivery to site
2. Organic content test results of the BSM, performed in accordance with Testing Methods for the Examination of Compost and Composting (TMECC) 05.07A, "Loss-On-Ignition Organic Matter Method."
3. Permeability test results for BSM per ASTM D2434 (Modified).
4. Moisture – density relationships (compaction tests) shall be conducted on bioretention soil. Bioretention soil for the permeability test shall be compacted to 85 to 90 percent of the maximum dry density (ASTM D1557).
5. Tests shall have been completed a maximum of 2 months prior to delivery to the project site.

1.6 SITE CONDITIONS

A. Environmental Requirements:

1. Comply with Special Provisions and Division 1 requirements.
2. Prior to Work commencement review and clearly mark in field horizontal and vertical location of existing public underground utilities and structures with respective Owner's Designated Representative.
3. Do not work soil when moisture content is so great that excessive compaction will occur, or when it is so dry that dust will form in the air or clods will not break readily.

1.7 SEQUENCING

A. Preemergent Herbicide: Apply after clearing and grubbing of meadow planting areas and prior to placement of topsoil.

B. Soil Placement: Avoid placing topsoil in areas subject to frequent construction vehicle and equipment traffic until traffic ceases, in order to help avoid the potential for excessive compaction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Regional Materials: Imported soil, manufactured planting soil, soil amendments and fertilizers shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

2.2 PESTICIDES

A. General: Pesticide, registered and approved by the United States EPA and the California Department of Pesticide Regulation, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction. Usage of pesticides and herbicides shall be consistent with County of San Mateo Integrated Pest Management policies.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level. Pre-Emergent Herbicide shall be approved for use in California and within San Mateo County. Pre-Emergent Herbicide shall be selected and applied to ensure that existing trees and shrubs are not impacted by the herbicide.

1. Glyphosate Round Custom

2.3 TOPSOIL

A. General: Planting Soil shall be friable and have sufficient structure in order to give good tilth and aeration to the soil. When amended, fertilized, and conditioned, the soil must be friable, be well drained and supportive of vigorous plant growth and contain low concentrations of inhibitory constituents. The soil must have sufficient moisture retention and nutrient retention to avoid excessive frequency of irrigation and frequency of fertilizer application.

1. Deleterious Materials: The soil must be clean and free of excessive gravel, rock, and physical impurities. Free of roots, clods, and stones larger than 1 inch in the greatest dimension, pockets of coarse sand, noxious weeds, sticks, lumber, brush, and other debris.
2. Disease-causing Organisms: Free of infestation of nematodes or other undesirable disease-causing organisms such as insects and plant pathogens.

B. Topsoil / Planting soils shall conform to the following ranges listed below in 2.2.C - I., unless otherwise specified under 2.5 Soil Mixes.

C. Soil Texture: Sandy loam as classified by the USDA Soil Texture Triangle classification method.

D. Saturated Hydraulic Conductivity: Not less than 2 inches per hour, nor more than 15 inches per hour. Testing per USDA Handbook, No. 60, Method 34B or other accepted methods.

E. Water and Air Management:

1. total pore space 40%-60% (Total Porosity)
2. Air space at field capacity 3%-20%
3. Water/moisture holding capacity 30% -50%

F. Chemical Characteristics

1. Acidity: 6.5 – 7.8 soil pH range measured in the saturation extract (Method 21a, USDA Handbook No. 60).
2. Salinity: 0.5 – 2.5 dS/m salinity range measured in the saturation extract (Method 3a, USDA Handbook No. 60).
3. CEC capacity mill equivalents per 100 grams: > 15
4. Chloride: at Initial testing 500 mg/liter can be accepted. However prior to delivery or following installation, and after not more than two irrigation cycles for leaching, the soil shall meet target ranges of: 150 mg/liter (parts per million) maximum concentration of soluble chloride in the saturation extract (Method 3a, USDA Handbook No. 60).
5. Boron: 0.1-0.7-mg/liter (parts per million) maximum concentration of soluble boron in the saturation extract (Method 3a, USDA Handbook No. 60).
6. Sodium Adsorption Ratio (SAR): Maximum of 3.0 measured per Method 20b, USDA Handbook No. 60.
7. Calcium Carbonate Content: No free calcium carbonate (limestone) present.
8. Available Aluminum: Less than 3.0 parts per million measured with the Ammonium Bicarbonate/DPTA Extraction.
9. Heavy Metals: The maximum permissible elemental concentration in the soil shall not exceed the following:
    a. Ammonium Bicarbonate / DTPA Extraction Parts per million (mg/kg dry-weight basis
        1) Arsenic 1.0
        2) Cadmium 1.0
        3) Chromium 10.0
        4) Cobalt 2.0
        5) Lead 30.0
        6) Mercury 1.0
        7) Nickel 5.0
        8) Selenium 3.0
        9) Silver 0.5
        10) Vanadium 3.0
    b. If the soil pH is between 6.0 and 7.0, the maximum permissible elemental concentration shall be reduced 50 percent. If the soil pH is less than 6.0, the maximum permissible elemental concentration shall be reduced 75 percent. No more than three metals shall be present at 50 percent or more of the above values.
10. Phytotoxic Constituent, Herbicides, Hydrocarbons:
    a. Germination and growth of monocots and dicots shall not be restricted more than 10 percent.
    b. Total petroleum hydrocarbons shall not exceed 50 mg/kg dry soil measured per the modified EPA Method No. 8015.
    c. Total aromatic volatile organic hydrocarbons (benzene, toluene, xylene and ethylbenzene) shall not exceed 0.5 mg/kg dry soil measured per EPA Method No. 8020.

G. Sand: Medium sized, number 16 sand

1. % passing:
    a. 4 mesh =100
    b. 10 mesh =98-100

c. 16 mesh =68-82
d. 32 mesh =0-20
e. 60 mesh =0-1

H. Organic Matter

1. Total Soil Organic Matter Content: Sufficient soil organic matter present to impart good physical soil properties, but not be excessive to cause toxicity or cause excessive reduction in the volume of soil due to decomposition or organic matter. The organic matter content shall be 2.0 – 5.0 percent by weight (Test) refer to soil mixes for requirements.

I. Fertility

1. Final Acceptable Fertility Range After Amendment:
   a. Ammonium Bicarbonate / DTPA Extraction Parts per million (mg/kg dry-weight basis:
      1) Phosphorus: 25 - 45
      2) Potassium: 120 - 180
      3) Iron: 4 - 20
      4) Manganese: 0.6 - 15
      5) Zinc: 1 - 10
      6) Copper: 0.3 – 5.0
      7) Boron: 0.1 – 0.7
      8) Magnesium: 25 - 100
      9) Sodium: 0 – 200
      10) Sulfur: 25 – 100
      11) Molybdenum: 0.25 – 1.0
      12) Chloride <150 ppm in saturation extract

2.4 ORGANIC COMPONENTS

A. Compost/Humus

1. Free of stones and debris
2. Humus material shall have an acid-soluble ash content of no less than 6% and no more than 20%. The organic matter content shall be at least 50% on a dry weight basis.
3. The pH of the material shall be between 6.2 and 8.2.
4. The salt content shall be less than 6 millimho/cm @ 25° C. (ECe less than 6) in a saturated paste extract.
5. Boron content of the saturated extract shall be less than 1.0 part per million.
6. Silicon content (acid-insoluble ash) shall be less than 50%.
7. Calcium carbonate shall not be present if to be applied on alkaline soils.
8. Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, peat mosses etc. low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials.
9. Composted wood products are conditionally acceptable, stable humus must be present. Wood based products are not acceptable which are based on red wood or cedar.

10. Sludge-based materials are not acceptable.
11. Carbon:nitrogen ratio is between 8.0 and 25:1.
12. SAR (sodium adsorption ratio) less than 5.
13. Seed germination - over 80% germination in saturation extract diluted 1 to 3 in water compared to seeds germinated in deionized water.
14. Germination vigor - equal to or better than seed length for seeds germinated in deionized water.
15. Maturity and stability – Solvita 6 or higher.
16. Molar ratio of ammoniacal nitrogen to nitrate nitrogen less than 2.
17. The compost shall be aerobic without malodorous presence of decomposition products.
18. The maximum particle size shall be 0.5 inch, 80% or more shall pass a No. 4 screen.
19. Maximum total permissible pollutant concentrations in amendment in parts per million on a dry weight basis:
    a. arsenic =12 copper =150 selenium =30
    b. cadmium =15 lead =100 silver =10
    c. chromium =100 mercury =10 vanadium =200
    d. cobalt =50 molybdenum =20 zinc =200
    e. nickel =100

B. Sphagnum Peat: For use as needed to reduce soil pH.
1. Medium-sized, minus 10 mesh
2. Minimum 60% organic matter, must not be excessively hydrophobic
3. pH 4.0 to 6.5
4. ECe less than 3 millimho/cm, minimum cation exchange capacity is 50 millimoles per 100 grams.
5. Carbon:nitrogen ratio less than 25, minimum cation exchange capacity is 50 millimoles

2.5 POTENTIAL CHEMICAL AMENDMENTS

A. Potential Chemical Amendments Required by Accepted Amendment Program and Backfill Mix:

1. Ground Limestone: Agricultural limestone containing not less than 85 percent of total carbonate, ground to such fineness that 50 percent will pass No. l sieve and 90 percent will pass No. 20 sieve.
2. Dolomite Lime: Agricultural grade mineral soil conditioner containing 35 percent minimum magnesium carbonate and 49 percent minimum calcium carbonate, 100 percent passing No. 65 sieve.
3. Gypsum: Agricultural grade product containing 80 percent minimum calcium sulfate.
4. Iron Sulfate (Ferric or Ferrous): Supplied by a commercial fertilizer supplier, containing 20 to 30 percent iron and 35 percent to 40 percent sulfur.
5. Sulfate of Potash: Agricultural grade containing 50 to 53 percent of water-soluble potash.
6. Single Superphosphate: Commercial product containing 20 to 25 percent available phosphoric acid.
7. Triple Superphosphate: Commercial product containing 45 percent available phosphoric acid.
8. Ammonium Sulfate: Commercial product containing approximately 21 percent ammoniacal nitrogen.

9. Calcium Ammonium Nitrate: Commercial product containing approximately 17 percent nitrogen as ammoniacal and 17 percent as nitrate nitrogen.
10. Calcium Nitrate: Agricultural grade containing 15-1/2 percent nitrogen.
11. Urea Formaldehyde: Granular commercial product containing 38 percent nitrogen.
12. IBDU (Iso Butyldiene Diurea): Commercial product containing 31 percent nitrogen.
13. Soil Sulfur: Agricultural grade sulfur containing a minimum of 96 percent sulfur.
14. Silicic Acid Calcium: Commercial grade.

2.6 SOIL MIXES

A. Provide the following soil mixes as the basis for bid. Final mix design and amendments shall be adjusted based on the Soil Quality Control program outlined in section 1.5.

1. Perennial Meadow – Forbs, Grassland and Red Fescue Top Dressing Amendment:
   a. Per Soil Test Results and Lab Recommendations
   b. Base Bid:
      1) 3 pounds Blood Meal (12- 0-0) and 3 pounds Feather Meal (12- 0-0) per 1000 SF.
      2) 10 pounds Steamed bone meal (2-14-0 per 1000 SF.

2. Bioretention Soil
   a. Planting mix of approved organic matter and coarse sand. The contractor shall designate their proposed import sources in advance and shall provide source samples of material.
   b. Material shall meet the San Mateo County County C3 biofiltration soil guidelines.
   c. The treatment planting soil shall have documentation from the supplier showing conformance to the San Mateo County County C3 biofiltration soil guidelines.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Place planting soil and fertilizers according to requirements in other Specification Sections.

B. Subgrade: Verify that the subgrade is at the correct elevation and slope.

C. Underground Utilities and Structures: Verify that the locations of utilities, structures and other underground items have been clearly marked.

D. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

E. Notification of Unsuitable Conditions: Before proceeding with work, Notify the Owner's Designated Representative in writing of unsuitable conditions and conflicts.

F. Notification: Before proceeding with Work, notify the Owner's Designated Representative in writing of unsuitable conditions and conflicts.

3.2 PREPARATION

A. Protection:

1. Use every possible precaution to prevent damage to existing conditions to remain such as structures, utilities, lighting, irrigation systems, drainage systems and lightweight fill.
2. Use every possible precaution to prevent excessive compaction of planting area soil within or adjacent to the areas of Work.
3. Provide barricades, fences or other barriers to protect existing conditions to remain from damage, contamination and excessive compaction during construction.
4. Submit written notification of conditions damaged during construction to the Owner's Designated Representative immediately.

B. Weed Eradication Program of Existing Vegetation at Perennial Meadow Areas: PA-05A, PA-05B and PA-06

1. Prior to planting and before tilling or amending planting areas, clear and grub – remove 2" topsoil while minimizing spilling or spreading of topsoil that could contain weed seeds. Remove and dispose of all material.
2. Pre-Plant Weed Management:
   a. Irrigate with 0.25-0.5" of irrigation, twice within 4 days.
   b. Allow 10-14 days for remaining weed seeds to germinate. Time to germination will vary with time and season.
3. Apply approved Pre-Emergent Herbicide as recommended by product label, and as required by regulatory authorities. The approved Pest Control advisor shall provide guidance on the rate of herbicide, surfactant and/or water conditioner that should be applied. Do not apply herbicide within the structural root zone of existing trees. Take maximum care to ensure that herbicide does not impact existing trees or shrubs. Approximately 5 days later, follow-up with manual removal of escaped or missed weeds, or use of a backpack sprayer to spot spray missed weeds.
4. Schedule removal of existing vegetation and application of Pre-Emergent Herbicide to optimize weed eradication and germination of the seed mixes based on best practices and manufacturer recommendations.
5. If density of emerged, dead weeds is going to impact the ability of contractor to prepare seedbed, consider either: 1) rake off detritus with minimal amount of soil disturbance (e.g., less than 0.5") to prevent re-exposing new weed seeds, or 2) very light cultivate soil (e.g., less than 0.5") to clear weeds and minimize exposing new seeds.

3.3 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

A. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.

3.4 TOLERANCES

A. Finish Grades: Refer to Section 329119 “Landscape Finish Grading”

3.5 HYDROSEED TOP DRESS AMENDMENT AND FERTILIZER

A. Provide Top-Dress Soil, amendment based on Soils test lab recommendations and Hydroseed provider.

3.6 FIELD QUALITY CONTROL

A. Soil Amendment and Placement Verification: Refer to Section 1.5 for amendment testing requirements.

1. The landscape architect may elect to take post placement samples to confirm soil quality and bulk density.
2. When a laboratory soil test indicates that the soil or soil mixes meet the requirements of the Specifications the Contractor will receive written notification of acceptance from the Landscape Architect.
3. Installation of ground cover plants and seed may commence upon Contractor’s receipt of the written notification of acceptance.

3.7 PROTECTION AND STOCKPILING OF TOPSOIL

A. In handling materials and operating tools and equipment, protect the soil from excessive compaction by laying down planks, plywood, or other accepted protective devices.

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Vehicle traffic.
4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.

C. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

D. Excavation and Stockpiling of Topsoil for reuse on site.
1. Soils up to 12-inches in depth shall be excavated and stockpiled for reuse at on-site location(s) coordinated with the Resident Engineer.
2. Stockpile management shall comply with Erosions Control requirements in the Plans and Specifications.
3. Stockpiles shall not exceed 5-feet in height.

3.8 REPAIR

A. Excessively Compacted Topsoil:

1. Mechanically loosen excessively compacted topsoil that exceed bulk density requirements as identified by the landscape architect to its full depth via a method acceptable to the Landscape Architect and re-grade surface smooth.
2. Keep topsoil from being excessively compacted until date of Final Completion.

B. Erosion Repair:

1. Repair erosion that occurs between soil installation and plant or seed installation.
2. Fill eroded areas with soil and finish grade.

END OF SECTION 329113

SECTION 329119

LANDSCAPE FNISH GRADING

PART 1 - PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Work Included: Execute finish grades complete, as shown, and as specified.

B. Work Specified Elsewhere:

1. Special Provisions Section 17“Site Clearing”
2. Special Provisions Section 19 "Earthwork"
3. Section 321441 “Sand-Set Flagstone Paving”
4. Section 321800 “Athletic & Recreational Surfacing”
5. Section 321813 “Synthetic Turf”
6. Section 328400 “Irrigation System”
7. Section 329113.19 “Soil Preparation”
8. Section 329400 “Planting Accessories”
9. Section 334600 “Landscape Drainage”

1.3 PROJECT/SITE CONDITIONS

A. Dust Nuisance: Assume full responsibility for alleviation or prevention of dust as a result of grading work.

1.4 SEQUENCING AND SCHEDULING:

A. Complete all finish grading prior to installation of sprinkler irrigation systems in each area graded.

B. Re-grade as required to finish grades established by Landscape Architect once the sprinkler system is installed.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify that the following items have been completed prior to commencement of finish grading:

1. Rough Grading.
2. Installation of stockpiled and import topsoil as required and soil preparation including debris removal.
3. Incorporation of soil amendments.
4. Installation of drainage and subsurface drainage.
5. Placement and setting of all electrical, water, santitary, and irrigation boxes and equipment.

3.2 LAYOUT

A. Lines and Elevations: The visual appearance and acceptable tolerances of the design is critically dependent upon the layout of the works. Include all costs and provide all instruments necessary to lay out the works accurately. Establish lines and elevation markers by survey instrumentation for finish grades and locations.

B. Include all costs and provide all calculations necessary to verify the subgrade, substrate and/or structural set-down elevations from the finish grades to earthwork grades. If any discrepancy is found notify the Landscape Architect in writing prior to commencement of rough grading.

C. Provide additional grade stakes and string lines as required to achieve grades and to enable field observations by the Landscape Architect. Re-instate markers/stakes as required throughout the works. The Landscape Architect may direct the layout of the more important landform elements and/or shall review the works when laid out and retains the right to adjust the layout.

3.3 FINISH GRADING

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

B. Provide a smooth transition between adjacent existing grades and new grades.

C. Grade with constant slope between points where elevations are given.

D. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

E. Slope grades to direct water away from buildings to drains or subdrains and to prevent ponding.

3.4 TOLERANCES

A. Comply with tolerances for lawn, grass and planting areas as follows:

1. Elevation: 1 inch.
2. Surface smoothness: Gap below 10-foot long straightedge not to exceed 1 inch in any direction.
3. Slope: unless otherwise noted on the Drawings not less than 1 percent fall.

B. Comply with tolerances for pavement and against building areas as follows:

1. Elevation: 1/4 inch.
2. Surface smoothness: Gap below 10-foot- long straightedge not to exceed 1/2 inch in any direction.
3. Slope: unless otherwise noted on the Drawings not less than 1 percent fall.
4. Hold finished grades below top of adjacent pavement, headers, curbs or walls as follows: 1 inch at lawn areas and 1-1/2 inch at groundcover areas.

3.5 ADJUSTING EXISTING UTILITY FEATURES

A. Adjust existing utility surface features to suit finish grade. Extend or reduce risers, boxes, chambers, basins and rings and reset castings, frames, grout beds, access doors, lids, covers and similar appurtenances.

3.6 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Landscape Architect.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.7 DISPOSAL

A. Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 329119

SECTION 329200

TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Hydroseeding.

B. Related Requirements:

1. Special Provisions Section 17 “Clearing and Grubbing”
2. Section 329113 “Soil Preparation”
3. Section 329119 “Landscape Finish Grading”
4. Section 320190 “Operation and Maintenance of Plantings”

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" and drawing designations for planting soils.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 INFORMATIONAL SUBMITTALS

A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for turfgrass sod plugs. Include identification of source and name and telephone number of supplier.

B. Product Certificates: For fertilizers, pesticides and herbicides (if allowed) from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf and grasslands during a calendar year. Submit before expiration of required maintenance periods.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf and meadow establishment.

1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
2. Experience: Five years' experience in turf and/or seeding installation similar in type and scale.
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.8 FIELD CONDITIONS

A. Coordinate site preparation and seeding operations to ensure that seeding occurs in in fall or early spring when moisture and soil temperatures are favorable for plant establishment.

B. Planting Restrictions: Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species:

Quality: % Purity, % Germination, % Pure Live Seed as required to successfully establish grass and meadow areas with full coverage and species distributed evenly throughout the seeded area.

C. Grass-Seed Mix: Fescue Mix

1. Products: Subject to compliance with requirements, provide the following:
   a. Pacific Coast Seed, Red Fescue Mix as indicated in Plans, or approved equivalent.

2.2 MEADOW GRASSES AND FORBS

A. Perennial Meadow Grassland and Forb Mixes.

1. Pacific Coast Seed, as indicated in Plans, or approved equivalent.

B. Seed Carrier: As recommended by seed provider and installer.

2.3 MULCHES

A. Straw Mulch: Pacific Coast Seed Hydrostraw or approved equivalent. Apply at 4,000 lbs per acre.

2.4 FERTILIZER

A. Biosol 7-2-1 at 1,000 lbs. per acre.

2.5 PESTICIDES

A. General: Refer to “Soil Preparation” Section.

2.6 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.

B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd. with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

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

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydromulching overspray.

B. Fertilizer: Apply per manufacturer's recommendations in Planting Areas PA-05A and PA-05B and PA-06.

C. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph .

1. Before sowing, mix seed with seed carrier at a ratio of not less than <Insert number> parts seed carrier to one part seed.
2. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
3. Do not use wet seed or seed that is moldy or otherwise damaged.
4. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rates as indicated in the Plans

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. If required to protect seeded areas from hot, dry weather or drying winds, apply mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch , and roll surface smooth.

E. Irrigate to allow germination if rainfall is insufficient. Irrigation management and site monitoring to maintain soil moisture is critical. Early morning irrigation timing is preferable. Irrigation amount will be the quantity needed to keep the top ¼ inch of the soil profile moist. Irrigation frequency during establishment will be every other day to once per week. Curtail irrigation to deep watering once per week or every other week, depending on the weather, to encourage deep root growth. Use a soil probe to confirm watering depth regularly during establishment.

F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

3.4 HYDROSTRAW

A. Hydroseeding: Mix specified strawmulch mulch in water, using equipment specifically designed for hydromulch application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with manufacturer's recommended tackifier.
2. Spray-apply hydromulch to all seeded areas. Apply slurry at a rate so that mulch component is deposited at not less than 2000-lb/acre dry weight.

3.5 MEADOW MAINTENANCE

A. Provide full maintenance by skilled employees of landscape Installer. Begin maintenance immediately after each area is seeded and continue for duration of Establishment Period as indicated in Section: 320190 “Operation and Maintenance of Plantings”.

B. Maintain and establish meadow by watering, weeding, mowing, trimming, replanting, and performing other operations as required to establish a healthy, viable meadow. Roll, regrade, and replant bare or eroded areas and remulch. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and meadow damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep meadow and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

C. Watering: verify and maintain turf-watering equipment (automatic irrigation system or temporary watering system) to keep meadow uniformly moist during germination and establishment. Do not apply additional fertilizer or water during the summer.

D. Criteria for Preliminary Acceptance:

1. Meadow and Grassland areas shall be fully germinated, and established with species that are consistent with the seed mixes.

2. No bare areas greater than 3 feet by 3 feet

3. Weed species shall not exceed 10% of seeded area.

3.6 WEED CONTROLL AND PESTICIDE APPLICATION

A. Maintain weed control during establishment period using best practices.

B. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.7 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200

SECTION 329300

PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Plants and Trees

B. Related Requirements:

1. Section 015639 "Tree Removal and Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
2. Section 329200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.
3. Section 328200 “Irrigation”
4. Section 329113 "Soil Preparation"
5. Section 329119 “Landscape Finish Grading”
6. Section 329350 “Plant Contract Growing”
7. Section 329400 “Planting Accessories”
8. Section 320190 “Operation and Maintenance of Planting”
9. Section 334600 “Landscape Drainage”

1.3 ALLOWANCES

A. Perform planting work under quantity allowances and only as authorized. Authorized work includes work required by Drawings and the Specifications and work authorized in writing by Landscape Architect.

B. Procedure: Submit a written change order for expenditures of cash allowance (in accordance with Division 1). Credit to Owner unexpended portion of cash allowance in the final project cost accounting.]

C. Notify Landscape Architect weekly of extent of work performed that is attributable to quantity allowances.

D. Perform work that exceeds quantity allowances only as authorized by Change Orders.

E. Include in the Base Bid a cash allowance in the amount of $10,000. Use this allowance for furnishing and installing additional plant materials and related items directed by Landscape Architect or Owner.

1.4 UNIT PRICES

A. Unit prices apply to authorized work covered by quantity allowances.

B. Unit prices apply to additions to and deletions from the Work as authorized by Change Orders.

1.5 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

C. Finish Grade: Elevation of finished surface of planting soil.

D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides. Verify whether chemical herbicides, insecticides and pesticides are allowed under project sustainability requirements and/or local jurisdictional regulation. Use of Chemical herbicides, insecticides and pesticides may also be prohibited by owner without prior exceptional approval.

E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

F. Planting Area: Areas to be planted.

G. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" for drawing designations for planting soils.

H. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

I. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

J. Aspect Ratio – Aspect ratio is the diameter of the branch relative to the diameter of the trunk, both measured immediately above the union. Branches with a small aspect ratio are very well attached to the trunk; those with a large aspect ratio separate more easily from the trunk.

K. Bleeding – Bleeding on the trunk of trees is often and indication of root disease. Trees exhibiting bleeding should never be selected.

L. Branch Spacing – The vertical distance between permanent scaffold branches.

M. Disease – Includes foliar, stem and root diseases. All have specific signs and symptoms for which the person doing the selection should be familiar.

N. Canker – A lesion or swelling caused by a disease or irrigations of cambial growth. Often a result of damage by the nursery stake when improperly secured.

O. Circling-Girdling Root – Roots that encircle the stems (trunks) of trees below the soil surface. Depending upon the bark characteristics, such circling roots can restrict the transfer of carbohydrates to the tree roots. Thin-barked trees can often connect cambial tissue and overcome the constriction.

P. Codominant – Two or more stems are of equal size and dominance in a tree crown. This can occur naturally or as a result of topping. Can be mitigated with subordination pruning.

Q. Container Size – Box sizes are in 12-inch increments. Bare root and B&B rootball size.

R. Cultivar – Trees that are grown from a specific clone. The clones are propagated by direct rooting or grafting or budding to a rootstock.

S. Crown – The trunk and scaffold branches that make up the above ground portion of the tree. Different tree species have different crown forms from excurrent and decurrent.

T. Diseased Roots – Identified by removing surface of the root with thumbnail. Brown/Black cambial color is indicative of root disease. Phytophthora test can also help identify root disease.

U. Gall – Tumor like growths on plant tissue produced by host plant in response to mechanical and/or chemical stimuli of invading organisms. Generally overall vigor/health of the tree is not negatively affected by galls. However, they can be unsightly.

V. Height – Tree height from the root crown to the top of the tree.

W. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

X. Understory Plants, Understory Planting: Shrubs, perennials, ornamental grasses, groundcover, annuals, bulbs - all plant material or planting area not indicated as "Tree".

Y. Included bark – A weak stem attachment that develops when the bark becomes embedded between two joined stems with a narrow angle between the two stems. The included or embedded bark precludes the joining of wood (xylem) tissue between the two stems.

Z. Kinked root – A primary root(s), which is sharply bent, causing a restriction to water, nutrient, and photosynthate movement. Kinked roots may compromise the structural stability of roots systems.

AA. Root Bound – A term describing a tree or plant that has outgrown its container size with the root mass large and concentrated. Such trees and plants are not acceptable

BB. Sunscald – Recognized by trunk discoloration or sunken areas that do not appear to be developing naturally. Such areas should be investigated for dead tissue, when suspected. The effects of sunscald are often not fully evident for a year or two after damage occurs.

CC. Temporary Branch – Branches ½ in diameter designated for removal. Allowing temporary branch to remain on trunk longer improves tree health, increases trunk taper, and helps to protect trunk from sunscald.

1.6 COORDINATION

A. Coordinate delivery and installation as outlined in 1.8.B.

B. Acceptance: Do not install plant materials prior to acceptance of finish grades (and main line trenching/installation of irrigation system).

C. General Coordination: Coordinate with work of other sections to insure the following sequence of events:

1. General: Irrigation system to be installed and operable prior to installation of plant materials. Schedule hand watering of all plant materials installed prior to sprinkler irrigation system.
2. Trees at On-Structure Building Levels: Schedule delivery of plants to coincide with completed installation lightweight geosynthetic fill and tree pit drainage systems. Locate trees in designated tree pits based on the Landscape Architects tree tag number and final tree planting plan.
3. Trees in Paving: As necessary, install prior to installation of paving under another Section.
4. Coordinate tree delivery and installation with the Landscape Architect and Project Arborist.

D. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.7 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.8 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.

B. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true

size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 100 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

C. Tree and Plant Procurement Schedule.

1. Provide schedule for Tree and Plant procurement including submission of nursery sources, submission of photos, and anticipated nursery visits for tree selection.

D. Planting Installation Schedule: Provide a schedule for the delivery and installation of all plant material for review and coordination. Maintain and update the schedule throughout the installation process. The installation schedule shall include:

1. Tree Delivery and Planting Schedule
2. Understory Planting area Mock-Ups as designated in Part 3
3. Understory Plant Material Delivery and Installation

E. Samples for Verification: For each of the following:

1. Shrubs, perennials and ground cover plants: Three Samples of each variety and size, with identification label, delivered to site for review. Maintain approved Samples on-site as a standard for comparison.
2. Organic Mulch: as indicated in Section 329400 “Planting Accessories”
3. Mineral (gravel) Mulch: as indicated in Section 329400 “Planting Accessories”

1.9 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

D. Sample Warranty: For special warranty.

1.10 CLOSEOUT SUBMITTALS

A. Maintenance Period, Substantial Completion and Final Acceptance protocols per Section 320190 - OPERATION AND MAINTENANCE OF PLANTING.

1.11 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Plant Sourcing: Require an experienced plant finder whose work has resulted in successful sourcing, selection and delivery of quality plants. Hire a plant broker if necessary.
5. Delivery Supervision: Require an experienced person who can assess the condition of the plants at the time of loading and unloading and who can resolve any disputes on site.
6. Personnel Certifications: Installer's shall have certification in of the following categories from the Professional Landcare Network:
   a. Landscape Industry Certified Technician - Exterior.
   b. Landscape Industry Certified Interior.
   c. Landscape Industry Certified Horticultural Technician.
7. Specimen Tree moving qualifications: Statement of qualifications including not less than five (5) years experience in transplanting trees of equivalent size and scale in the State of California. Include documentation of ISA Certified arborist.
8. Pesticide Applicator: State licensed, commercial.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

1. Selection of plants purchased under allowances is made by Landscape Architect.

C. All plants shall comply with federal, state and county laws requiring inspection for plant diseases and pest infestations. Inspection certificates required by law shall accompany each shipment of plants. Clearance from the County Agricultural Commissioner, as required by law, shall be obtained before planting trees delivered from outside the county in which they are to be planted. Even though trees may conform to county, state and federal laws, the buyer may impose additional requirements.

D. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of shrub for height and spread; do not measure branches or roots tip to tip.
2. Trees: Take caliper measurements (DBH) 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for 4” or larger sizes. Measure height of first branch to first branch of ½” diameter or greater.
3. Other Plants: Measure with stems, petioles, and foliage in their normal position.

E. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect may also observe trees and shrubs further for size

and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Landscape Architect of sources of planting materials seven days in advance of delivery to site.

F. Understory Planting Mock-Ups: For each Understory Planting Type or Zone identified in the drawings and plant schedules provide a planting area mock-up/first install as directed by the Landscape Architect.

1. For each type and area deliver plant material and layout in pots as indicated on the plans for review and adjustment by the Landscape Architect.
2. Specific layout, spacing, and installation requirements will be provided as part of mock-up review
3. Mock-ups will serve as a basis for spacing and layout of plants.

G. Trees

1. Tree Selection: All trees shall be reviewed by the Landscape Architect and Consulting Arborist and tagged at the nursery as part of the procurement process. The Landscape Contractor shall review trees at Nurseries at their discretion and as required to warrant the material as specified in this Section.

2. Preliminary information to be attained from Nursery prior to nursery visit:
   a. Number of trees in stock. Preferable to have minimum 3x the amount sought.
   b. Current photo of representative tree for each tree species/size.
   c. Size specification indicating height, spread, caliper.
   d. Upon request additional information may also be required such as:
      - Date when last moved up in box size.
      - Date when trees require shifting to larger box size.
      - Tree Caliper or DBH
      - Height of first branch > ½" diameter

3. Pre-Selection Requirements:
   a. Species identification and tagging – All trees shall be true to type of name as designated and shall be individually tagged with locking number tags or tagged in groups by species and cultivar (variety).
4. Tree Condition
   a. All trees shall be healthy, have a form typical of the species or cultivars, be well-rooted and properly trained.
   b. As typical for the species/cultivar, trees shall be healthy and vigorous, as indicated by an inspection of the following:
      1) Density of crown foliage
      2) Length of shoot growth (throughout crown)
      3) Size, color, and appearance of leaves
      4) Uniform distribution of roots (bare-root or in the container media)
      5) Appearance of roots
      6) Absence of twig and/or branch dieback
      7) Relative freedom from insects and disease

8) The height, crown spread, diameter, and root size of all trees shall be appropriate for the type of stock and in proportion to one another.

c. Inspection Certificates – All trees shall comply with Federal and State laws requiring inspection for plant disease and pest infestations. Inspection certificates required by law shall accompany each shipment of plants. Clearance for the County Agricultural Commissioner, as required by law, shall be obtained before planting trees delivered from outside the County in which they are to be planted.

d. Roots

1) Overgrown Planting Stock – First sign of root problems can be identified when trees are larger than they should be for the container size. The weathered condition of the wooden box container can also provide signs of potential problems.

2) At time of inspection and delivery, the rootball shall be moist throughout, and the tree crown shall show no signs of moisture stress, as indicated by wilted, shriveled, dead leaves, or branch dieback. Roots shall show no signs of being subjected to excess soil moisture conditions, as indicated by root discoloration, death, or foul order.

3) The trunk, root collar (root crown) and large roots shall be free of circling and/or kinked roots. Soil removal near the root collar may be necessary to inspect for circling and/or kinked roots.

4) The tree shall be well rooted in the soil mix. When the trunk is carefully lifted both the trunk and root system shall move as one. When the container is removed, the rootball shall remain intact.

5) Root Crown - The upper-most roots or root collar should be within 25 mm (1 in.) above or below the container soil surface. Condition of root crown shall be confirmed by using a gloved hand or water pressure, expose the roots within 2-inches of the trunk to a depth of 2.5-inches below the topmost root attached to the trunk. This will identify:
   - Depth of root crown.
   - Circling, potential girdling roots.

   Replace soil washed from around trunk after inspection.

6) The rootball periphery should be free of large circling and bottom-matted roots. The acceptable diameter of circling peripheral roots depends on species and size of the rootball, and is generally ¼ - 3/8” in diameter. The outer rootball can be inspected by using small pick, excavating along sides of container to identify where rooting begins. If problems are suspected, a minimum of 10% of any trees being selected shall be either removed from the container for viewing or have soil surrounding the tree removed.

7) Bare-root stock: Shall meet above specifications except sections III B and VI. Root spread shall adhere to the most recent edition of ANSI 760.1 sections 1.2, 1.2.1 and 1.2.2

8) Roots – Reasons for deselection of Nursery Stock
   a) Any movement is detected in rootball when shaking trunks
   b) Excessive roots larger than ¼ inch at edge of rootball and/or matted root over ¼ inch
   c) Roots larger than one-fifth (1/5) the trunk diameter circling the trunk
   d) “Knees” (roots) protruding above the soil
   e) Root crown buried over 1”
   f) Dead or damaged roots

e. Trunk
   1) Trunk diameter and taper shall be sufficient so the tree will remain upright in a container without the support of a nursery stake or when the trunk of a bare-root tree is held vertically rigid just above the nursery soil level.
   2) The trunk and branches shall be free of wounds (except properly-made pruning cuts), sunburned areas, conks (fungal fruiting-bodies), wood cracks, bleeding areas, evidence of boring insects, galls, cankers, and/or lesions.

f. Crown – preferred structural attributes:
   1) Canopy/general – Trees shall have a symmetrical form as typical for the species/cultivar. The tree stands upright without support, unless the tree is bare root. Trees shall be visually inspected on all sides:
      a) Leaf size and color
      b) Early signs of sunscald
      c) Branch attachments
      d) Dominance
      e) Branch size and spacing
      f) Trunk or scaffold damage
      g) Signs of disease or insect
      h) Discoloration or bleeding on bark
      i) Wounding from staking

   2) Excurrent: Tree form in which a strong central leader (a single, straight trunk that has not been headed or that could be pruned to a central leader) is present to the top of the tree with radial and vertical distribution of branches that form a symmetrical crown, ideally free of upright branches competing with the leader. Includes most conifers and some broad-leaved species such as sweet gum and tuliptree.

   3) Decurrent: Tree form made up of a system of codominant scaffold branches lacking a central leader (round-headed crown when mature). Primarily includes broad-leaved species.
      a) Potential scaffold branches should be spaced radially around and vertically along the trunk, forming a generally symmetrical crown typical for the species. Minimum vertical spacing between branches may be specified.
      b) Branch diameter shall be no larger than 2/3 (two thirds) the diameter of the trunk, measured 25 mm (1 in.) above the branch.
      c) Attachment of the scaffold branches shall be free of included bark (bark embedded in the sharp angle of attachment between a branch and trunk or another branch. Note: This section applies primarily to single trunk trees, as typically used for street and landscape planting. These specifications do not apply to plants that have been specifically trained to have topiary, espalier, multi-stem, clump, or other unique forms.
      d) Temporary branches: Unless otherwise specified, small branches should be present along the lower trunk and between potential main branches, particularly for trees less than 40 mm (1.5 in.) in trunk diameter. Temporary branches should be distributed radially around and vertically along the trunk. They should be no greater than 10 mm (0.4 in.) in diameter and no greater than ½ (one-half) the diameter of

the trunk at the point of attachment. Heading of temporary branches is usually necessary to limit their growth.

4) Branching: Potential lateral scaffold branches (height of lowest scaffold depends on the landscape use)
   a) Small-growing trees (crepe myrtle, flowering fruit trees): Branches should be at least 2-inches apart vertically; which could be trained in the landscape to 3 to 7 branches 4-inches or more apart vertically.
   b) Large-crowning trees (ash, oak): Branches should be at least 6-inches apart vertically; which could be trained in the landscape to 5 to 9 branches 18-inches or more apart vertically;
   c) Branches should be radially distributed around the trunk.

g. Soil Type – Note tree media soil type. Excess organic material can result in excessive settling after planting.
h. Field dug Stock: insure that any excess loose fill over roots be removed down to natural finish grade at original crown of tree. During digging, verify that size of tree spade or other equipment is adequate to encompass the actively-growing root zone. Trees which, after digging, show mostly large fleshy roots and few fibrous roots will be rejected.
i. Reasons for Deselection of Nursery Stock
   1) Visual Crown Inspection Results – Any of the health or structural conditions noted in visual crown inspection (Section VII).
   2) Aspect Ratio – Branches shall not be more than two-thirds (2/3) the diameter of the trunk, measured 1-inch above the branch.
   3) Included Bark – Branch attachments shall be free of included bark (bark embedded between the trunk and a lateral). Included bark attachments less than ½ can be pruned out.
   4) Temporary Branch Size – No lateral branch below the height of the first permanent scaffold branch shall be larger than ½".

1.12 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

C. Notification: Notify Owner at least two (2) weeks in advance of date when plants will be picked up and transported to the place of installation.

D. Inspect plants prior to acceptance and notify Landscape Architect of all unacceptable plants. Pick up of plants shall constitute acceptance for the purpose of warranties.

E. All trees shall be reviewed upon delivery to the site and approved prior to installation by the County Arborist.
   1. Arborist Review: Coordinate with Landscape Architect and Project Arborist to schedule review and inspection of all trees upon delivery to site. The Arborist shall review and approve all trees upon delivery and prior to installation.
   2. Root Ball inspection:
      a. The Arborist shall review all trees for circling roots or other defects upon delivery. This inspection does not relieve the installing contractor from noting unforeseen root issues such as circling/girdling roots, excessively root bound or desiccated roots, etc.
      b. The Arborist shall be present for the unboxing of one or two specimens from every block of trees, and participate in root pruning. Direction will be provided for specific root ball scarification. Information on soil type and any special establishment irrigation needs will be relayed to the Owner/contractor team.
      c. The Arborists shall inspect all specimen tree root balls (84-inch box and above) following placement and removal of boxes and prior to backfill. The Arborist may recommend root pruning, or other measures to address root issues prior to backfill. The arborist may reject trees if box removal indicates that girdling roots, pathogens, or other issues could impact the health and viability of trees.

   3. Arborist Inspection Services and Costs
      a. Delivery and Installation Inspections: Services and Costs shall be provided by the Owner as part of Testing and Inspections.
      b. Maintenance Period Arborist Services: Services and Costs shall be provided by the Contractor as part of Testing and Inspections.

   4. Rejection of delivered material - In case the sample trees inspected are found to be defective, the buyer reserves the right to reject individual trees, the entire lot or lots of trees represented by defective samples. Any plants rendered unsuitable for planting because of this inspection will be considered as samples and will not be paid for.

F. Deliver bare-root stock plants within 24 hours of digging. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting. Transport in covered, temperature-controlled vehicles, and keep plants cool and protected from sun and wind at all times.

G. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

H. Handling:

   1. Protect plant material at all times during handling, storage and planting from extreme weather conditions, wind, drying roots and rootballs and injury.
   2. Support root system of container plant material when lifting and moving to minimize injury to the root system. Do not lift or handle plants by tops, stems or trunks at any time. Do not bind or handle plants with wire or rope at any time.

3. Plant material showing damage from shipping, while in storage or during planting may be rejected by the Owners Representative. Rejected plant material shall be re placed by the contractor at his own expense.

I. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.

J. Anti-Desiccant: at Contractor's option, apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

K. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

L. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.13 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Planting Restrictions: Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.14 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
   b. Structural failures including plantings falling or blowing over.
   c. Faulty performance of irrigation operations.
   d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
2. Warranty Periods: From date of Final Acceptance
   a. Trees: 12 months.
   b. Shrubs, and Vines 6 months.
   c. Ground Covers, Biennials, Perennials, and Other Plants: 6 months.
   d. Annuals: 6 months.
3. Include the following remedial actions as a minimum:
   a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
   b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
   c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
   d. Provide extended warranty for period equal to original warranty period, for replaced plant material.
4. Incorrect Materials:
   a. During Warranty Period, replace at no cost to Owner plants revealed as being untrue to name and species.
   b. Provide replacements of a size and quality to match the planted materials at the time the mistake is discovered.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

   1. Trees shall be so trained or favored in development and appearance as to be superior in form for their species, with regard to number of branches, compactness and symmetry. Trees shall be in good to excellent condition as specified above in Tree Condition 1.11.G.5.
   2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.

1. Plants shall: have a normal amount of flowers, fruit, cones, and seeds, be well-rooted so that when trunk bends along its vertical length and no pivoting at the base or moving the root ball, have a symmetrical/radial pattern of well-branched fibrous roots without crushed/torn ends, and be free of weeds.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

1. Condition of Root System: Samples must prove to be completely free of circling, kinked or girdling trunk surface and center roots and show no evidence of a pot-bound condition. Upon inspection by Landscape Architect at the job site, if five (5) percent or more of the plants of each species are found to contain kinked, circling or girdling roots, all plants of that species will be rejected.

D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.

E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

F. Annuals and Biennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.

2.2 FERTILIZERS

A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

1. Size: 21-gram tablets.
2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

B. Granular Slow-release Fertilizer: To be used only where soils tests identify specific limitations or fertility requirements, for 36” box size and larger plant material, including Specimen Trees.
1. Submit product data and application rates for review prior to implementation.

2.3 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Arbormulch as provided by the County Parks Department.

2.4 SOIL MIXES

A. Planting Soil and Backfill Soil mixes: as described in section: 329313 Soil Preparation

2.5 MISCELLANEOUS PRODUCTS

A. Tree Stakes: Refer to Drawings.

B. Water: Clean, fresh and potable. Transport as required

C. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

D. Burlap: Non-synthetic, biodegradable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Finish Grades: Finish grades for planting areas shall have been established per Section 329119 “Landscape Finish Grading”. Verify that all grades are within 1 in. plus or minus of required finish grade prior to installation of any plant material.
2. Landscape Soils: Do not commence planting work prior to completion and acceptance of soil preparation.
3. Irrigation: Verify that irrigation system has been installed and accepted.
4. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
5. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
6. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
7. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with approved planting soil.

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

3.2 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329115 "Soil Preparation”

B. Placing Planting Soil: place and mix planting soil as indicated in Section 329115 "Soil Preparation”and Section 329119 "Landscape Finish Grading"

C. Before planting obtain Landscape Architect's acceptance of finish grading, restore planting areas if eroded or otherwise disturbed after finish grading.

3.3 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Pre-installation Conference: Conduct conference at Project site with Owner, Landscape Architect, Contractor (Field lead) to review the planting schedule and plant zone mock-ups.

D. Tree Locations: Stake the location of each tree, verify location specific to plan dimension or alignment.

E. Building-Level (over-structure) Tree Locations: Tree Pit Locations must be accurately installed per approved Lightweight Geosynthetic Fill shop drawings. Pit location layout shall be inspected and approved in writing prior to placement of trees. Note that some trees may be shifted within the designated tree pits to allow for adjacent grading requirements.

F. Understory Layout and Staking: Following completion of mock-ups. Outline understory planting zones with lime or non-toxic marking paint.as indicated in drawings and schedule planting area layout review prior to placement in installation of plants.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches:

1. Dig tree pits in sizes as indicated in the Drawings and as indicated below. Do not use an auger or tree spade. Excavate planting holes per Drawing details to dimensions dictated by the rootball dimensions. Tree pits shall be excavated to required depth so that drainage courses sit directly on unexcavated soil. Do not further disturb base. Ensure that plant root ball will sit on undisturbed base soil to prevent settling. Scarify sides of tree pits smeared or smoothed during excavation.
2. If tree pits are over excavated than depth of root ball, construct a planting pedestal by mixing 3 parts angular drainrock (3/4” to 1.5”) with 1 part native soil. Compact the mix of rock and soil in 6 inch lifts until proper pit depth is achieved and as needed to prevent settlement of finish grade of the rootball.
3. Minimum pits for containerized plants:

a. Boxed Trees: Width = 2x container width or as indicated in The Drawings, depth = to depth of root ball or as indicated in The Drawings.
b. Container Plants: Width = 3x container width, Depth = 2" less than root ball to allow for mulch

4. Do not excavate plant pits deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling. Over-excavated tree pits shall be corrected per 3.4.A.2 above.
6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
7. Maintain supervision of excavations during working hours.
8. Keep excavations covered or otherwise protected after working hours.
9. If subdrain pipe is indicated on Drawings or required under planting areas, excavate to top of porous backfill over pipe.

B. Backfill Soil: provide backfill as indicated in the Drawings Soil Schedule and per requirements of Section 329113 “Soil Preparation " Existing Soils may be used as backfill soil unless otherwise indicated.

C. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
2. If rock, underground construction work, tree roots or other obstructions are encountered in the excavation of plant pits, acceptable alternate locations may be used at direction of Landscape Landscape Architect.

D. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Tree Pit Drainage Testing: perform the following drainage testing where evidence of poor drainage of tree is found

1. In designated areas perform the following test: Minimum number to be tested shall be one (1) pit per every five (5) pits.
2. Auger a 12” diameter x 10” deep hole in the bottom of a sample tree pit. Fill with 10 inches of water [1]. Allow to drain.
3. Fill test drain hole with 10 inches of water again [2]. Document percolation every hour
4. Legibly calibrate a stake at 1 in. intervals and drive it firmly into the undisturbed soil at the bottom of the hole
5. Fill the 10 inch hole with water to the top. Immediately record water level on the stake.
6. Document water level every hour for 20 hours
7. Document amount of standing water at end of 20 hours.
8. Do not perform test on a rainy day. Repeat all tests interrupted by rain or cold.

F. Drainage Correction: Where tree pits fail drainage test, improve drainage before installation of trees by constructing tree pit dry well, adding subdrainage piping, or other measure as approved by Landscape Architect.

3.5 SPECIMEN TREE PLANTING (84" BOX AND LARGER)

A. Off load tree with crane or other lift operated and supervised by qualified certified personnel experienced in lifting and placement of large specimen trees. Do not remove box prior to setting tree in plant pit. Remove sides of box after acceptance by Owner's Representative and prior to backfilling. Bottom of box may be left in place.

B. Positioning: For all Specimen trees the Landscape Architect shall be on-site during placement to direct the orientation and vertical setting of the trees.

3.6 TREE, SHRUB, AND VINE PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

C. All plants and trees shall be kept with soil at field-capacity moisture levels. No plant or tree shall be installed with dry or desiccated root balls.

1. Plants that have dried out shall be fully moistened prior to removal from container by fully immersing the plant in its container into a bucket or large container of water for a minimum of 5 minutes or until the root ball has become fully saturated.

D. Avoid damage to containers and rootballs and plant crowns. If rootball is cracked or broken, plant crown broken or weakened during handling and de-potting, plant will be rejected. Do not remove plant from container prior to completion of plant pit preparation.

E. Boxed Trees:

1. Lift from bottom with forklift or from sides with 2 in. x 4 in. rails nailed to each side of box. Do not remove box prior to settling tree in plant pit. Remove sides of box after acceptance by Landscape Landscape Architect and prior to backfilling. Bottom of box may be left in place on 48" and larger tree boxes
2. After removing tree from box, scarify the sides of the rootball to a depth of 2 in. in vertical cuts, at least two per side. Remove up to 3" of matted roots from bottom of root ball. Cut and remove circling roots over 3/8 in. diameter
3. Backfilling:
    a. Use specified planting soil backfill mix to backfill pits as shown on Drawings.
    b. Backfill pit in 12" maximum lifts. After each lift, water backfilled soil thoroughly and saturate the rootball, eliminating all air pockets before installing next lift. Repeat procedure as required to bring backfill to proper level.

F. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 3 inches above adjacent finish grades.

1. Backfill: Planting soil as indicated in The Drawings and Section 329113 "Soil Preparation"

2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
    a. Quantity: three for each caliper inch of plant.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

G. Container grown plants in plastic containers up to 15 gallon: Tip container to horizontal orientation and shake carefully to remove shrub. Support rootball during installation to prevent cracking or shedding of soil. 2 inches above adjacent finish grades.

1. Rootball Scarification:
    a. 1 gallon containers: After removing from container loosen any matted roots from side and bottom of root ball. Use sharp hand pruners to remove any loose roots.
    b. 5 gallon and 15 gallon containers: After removing plant from container, scarify the sides of the rootball to a depth of 1 in. at four to six equally-spaced locations around the perimeter of the ball. Remove up to 2” of matted roots from bottom of root ball.
2. Backfilling: .
    a. Use approved planting soil to backfill pits
    b. Brace each plant plumb and rigidly in position until planting soil has been lightly placed around the ball and roots.
    c. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed
3. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole
4. Place granular slow release fertilizer granules, where indicated, as specified and approved.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

H. Watering Basin

1. Trees, and 24” or larger shrubs: Form saucer with soil berm centered around plant material and as noted in the drawings. Do not form saucer around trees in lawn areas
2. Specimen Tree watering basin: Construct 2 concentric saucers with soil berms centered around Specimen Tree and as noted in the drawings. Do not form saucers around Specimen Trees in lawn areas

I. Watering: Thoroughly water-in all plants after backfill so that soil flows and fills all air gaps. Water all plants again after completion of planting operations. Apply water to the top of the rootball being careful not to damage stem or excessively erode the soil. For hand watering, use a water wand to break the water force. Do not permit use of “jet” type watering equipment. Do not permit root crown to become exposed to air through dislodging of soil and mulch.

1. Specimen Tree Initial Deep Watering: Immediately water Specimen Tree by filling specimen tree watering basins to a 12” depth. Allow water to drain in. Perform initial deep watering at least 3 times the day of Specimen Tree planting.

J. Watering Pipe at Trees: During backfilling, install watering pipe 4 feet deep into the planting pit outside the root ball as indicated on Drawings.

K. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

L. Fertilization:

1. Slow-release Fertilizer Tablets: Place evenly distributed in plant pits, directly around the rootball sides, when backfilled 2/3 according to the following schedule or per Manufacturer’s latest specifications.
   a. 1 gallon = 2 tablets
   b. 5 gallon = 4 tablets
   c. 15 gallon = 6 tablets
   d. 24" box = 8 tablets
2. Granular Slow-release Fertilizer: To be used for 36” box size and larger plant material, including Specimen Trees. Evenly distributed granules in plant pits, directly around the rootball sides, when the plant pit has been backfilled 1/3 of the plant pit depth, and when the plant pit has been backfilled 2/3 of the plant pit depth. Apply quantities as described below. Quantities are total quantities per tree:
   a. 36"-48" box = 4 lbs.
   b. 60" box = 9 lbs.
   c. 72"-84" = 17 lbs.
   d. 96"-108" = 24 lbs.
   e. 120"-132"= 50 lbs.

3.7 TREE, SHRUB, AND VINE PRUNING

Retain one of first three paragraphs in this article. Retain first as a minimum requirement. Retain second if Landscape Architect delivers instructions for pruning. If retaining third, revise description of pruning requirements if needed. Pruning is usually limited to removing 10 to 15 percent of top growth.

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Do not apply pruning paint to wounds.

C. Refer to Section 329360 "Operations and Maintenance of Planting" for detailed pruning information.

3.8 TREE STAKING

A. Stake trees according the tree planting schedules and as directed by the Landscape Architect based on tree procurement. For bidding purposes provide unit costs for staking types and sizes according to the tree schedule and to allow for cost adjustment based on tree procurement.

B. Locate stakes as detailed in the Drawings, and per manufacturer's specifications. Install stakes as noted in the drawings and as close to the main trunk as is practical, avoiding root injury and tree branch injury.

C. Remove nursery-supplied stake and tie to new stakes using approved tree ties. Find proper height for point of tree ties and attach as follows

1. Hold trunk in one hand, pull top to one side and release. The Base Height is the height at which the trunk snaps back to an upright position while hand-held. Attach tree ties to trunk 6 in. above Base Height.

3.9 PLANTING AREA MULCHING

A. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees in Turf Areas: Apply organic mulch ring of 3-inch average thickness, with 36-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
2. Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.
3. Mineral Mulch in Planting Areas: Apply in 2-inch average thickness of mineral mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 6 inches of trunks or stems.

3.10 PLANT MAINTENANCE

A. General

1. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
2. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
3. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents. Use of pesticides is only by prior approval by owner.

B. Refer to Section 329360 "Operation and Maintenance of Planting" for establishment and maintenance requirements.

3.11 REPAIR AND REPLACEMENT

A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Landscape Architect.

1. Submit details of proposed pruning and repairs.

2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.

B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition or are damaged during construction operations that Landscape Architect determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size as those being replaced for each tree of 6 inches or smaller in caliper size.
2. Provide one new tree(s) of 6-inch caliper size for each tree being replaced that measures more than 6 inches in caliper size.
3. Species of Replacement Trees: Same species being replaced.

3.12 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.13 MAINTENANCE SERVICE

Verify with Owner that maintenance service is required for Project. Consider deleting this article for small-scale residential projects. Generally, a maintenance period should be long enough to ascertain the initial establishment of healthy plants.

A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Section "Operations and Maintenance of Planting". Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

1. Maintenance Period: as required in Section 329360 "Operation and Maintenance of Planting".

END OF SECTION 329300

SECTION 329400

PLANTING ACCESSORIES

PART 1 - PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Work Included:

1. Landscape Edging
2. Organic Mulch
3. Gravel Mulch

B. Related Sections:

1. Section 320190 “Operation and Maintenance of Plantings”
2. Section 329119 “Landscape Finish Grading”
3. Section 329200 "Turf and Grasses"

1.3 SUBMITTALS

A. Product Data - Manufacturer's current catalog cuts and specifications of the following:

1. Landscape Edging
2. Organic Mulch
3. Aggregate / mineral Mulch

B. Samples:

1. Organic Mulch: 1/2 gal. bag, each type.
2. Aggregate / mineral Mulch: 1/2 gal. bag, each type.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver all products and specified component parts to project site in appropriate protective packaging as furnished by manufacturer. Packaging for each unit shall be clearly labeled.

B. Store units at project site to prevent exposure to weathering, vandalism or damage from work of other trades. Damaged materials will be rejected. Remove all damaged materials from the job site immediately, and replace at no cost to the Owner.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of exterior plants.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when exterior planting is in progress.
2. Specifications for products that include manufacturer’s written instructions are described in this section for Contractor’s convenience. Actual components and installation instructions shall be based on the most currently available manufacturer’s product literature, unless otherwise noted.

1.6 MAINTENANCE PERIOD AND FINAL ACCEPTANCE

A. Refer to Section 320190 “Operation and Maintenance of Plantings” for maintenance of landscape accessory items during the landscape maintenance period.

1.7 REPLACEMENTS

A. Failed Materials:

1. Repair and/or replace at no cost to the Owner all planting accessory materials exhibiting conditions which are determined as unacceptable due to workmanship by the Contractor.

PART 2 - PART 2 - PRODUCTS

2.1 ORGANIC MULCH

A. Organic Arbormulch free of dirt and other debris; as supplied by the County Parks Department.

2.2 GRAVEL MULCH

A. Per Materials Schedule in Drawings or approved equal.

PART 3 - PART 3 – EXECUTION

3.1 EXAMINATION

A. A.Verification of Conditions:

1. Finish Grades: Finish grades for planting areas shall have been established per Section 329119 “Landscape Finish Grading” prior to installation of any plant material.
2. Landscape Soils: Do not commence planting work prior to completion and acceptance of soil preparation.
3. Irrigation: Verify that irrigation system has been installed and accepted.

3.2 EDGING INSTALLATION

A. Wood Edging: Install edging where indicated. Mitre cut joints and connections at a 45-degree angle. Fasten each cut joint or connection with two galvanized nails. Anchor with wood stakes spaced up to 36 inches apart, driven at least 1 inch below top elevation of edging. Use two galvanized nails per stake to fasten edging, of length as needed to penetrate both edging and stake and provide 1/2-inch clinch at point. Predrill stakes if needed to avoid splitting. Replace stakes that crack or split during installation process.

B. Aluminum Edging: Install aluminum edging where indicated according to manufacturer's written instructions. Anchor with aluminum stakes spaced approximately no more than 30 inches, driven below top elevation of edging.

3.3 ORGANIC MULCH

A. Install a 3-inch layer of organic mulch over all shrub areas including tree and shrub watering basins.

1. At trees in planting area provide 12-inch diameter circle clear of mulch centered on tree trunk.

3.4 GRAVEL MULCH

A. Install a 2-3 inch layer of mulch over all bioretention and other planting areas as indicated on The Drawings.

3.5 FINISH GRADING

A. Refer to Section 329119 “Landscape Finish Grading”.

3.6 CLEANING

A. Upon completion of work or as directed by Owner, remove all trash, debris, surplus materials and equipment from site and legally dispose of off the project site.

END OF SECTION 329400

SECTION 329600 - TRANSPLANTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes transplanting non-nursery-grown trees by tree spade or digging and boxing.

B. Related Requirements:

1. Section 015639 “Tree & Landscape Protection” for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
2. Section 329113 “Soil Preparation”
3. Section 329300 "Plants" for new trees from nursery-grown sources.
4. Section 329400 "Planting Accessories."

1.3 UNIT PRICES

A. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.4 DEFINITIONS

A. General: See definitions in ANSI A300 (Part 6) and in ANSI Z60.1 pertaining to field-grown trees, except as otherwise defined in this Section.

B. Caliper: Diameter of a trunk as measured by a diameter tape at a height 6 inches above the root flair for trees up to, and including, 4-inch size at this height; and as measured at a height of 12 inches above the root flair for trees larger than 4-inch size.

C. Caliper (DBH): Diameter breast height; diameter of a trunk as measured by a diameter tape at a height 54 inches above the ground line.

D. Root-Ball Depth: Measured from bottom of trunk flare to the bottom of root ball.

E. Root-Ball Width: Measured horizontally across the root ball with an approximately circular form or the least dimension for non-round root balls, not necessarily centered on the tree trunk , but within tolerance according to ANSI Z60.1.

F. Root Flare: Also called "trunk flare." The area at the base of the tree's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

1.5 QUALITY ASSURANCE

A. Tree-Service Firm Qualifications: An experienced landscaping contractor or tree-moving firm that has successfully completed transplanting work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.

1. Qualification Data: Submit Statement of qualifications for qualified tree-transplant firm and arborist, including reference contact information for minimum 5 completed tree relocation projects using spades and including trees of similar size and site logistics requirements. Include project name, location, date completed, number, species and size of relocated trees.

B. Arborist Qualifications: Licensed arborist in jurisdiction where Project is located.

1.6 PRE-TRANSPLANT REVIEW AND INSTALLATION MEETINGS

A. Pre-Transplant review and verification of Transplant Feasibility: Contractors shall retain a certified arborist and/or tree moving contractor to verify tree health and advise on transplant feasibility for each transplant tree identified in the Plans.

1. If the Tree Moving Contractor determines that any of the designated trees are not feasible to transplant, they shall provide a summary report stating the basis of their determination that the trees are not feasible for transplant.

B. Preinstallation Conference: Conduct conference at the site.

1. Review methods and procedures related to transplanting work include, but are not limited to, the following:
   a. Construction schedule. Verify availability of materials, personnel, equipment, and unimpeded access needed to make progress and avoid delays.
   b. Tree and plant protection.
   c. Tree maintenance.
   d. Arborist's responsibilities.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Tree-Transplanting Program: Prepare a written plan by arborist for transplanting trees for the whole Project, including each phase or process, tree maintenance, and protection of surrounding materials during operations. Describe in detail the materials, methods, and equipment to be used for each phase of the transplanting work.

1. Include transplanting times appropriate for each species at the Project location unless otherwise indicated on Drawings or directed by arborist.

2. Include a transplanting schedule for each species to be transplanted, coordinated with the Project schedule.
3. Include site plans clearly marked to show tree-moving routes from extraction to planting locations. Indicate proposed equipment, weight, and turning radii.
4. Show details of temporary protective barriers where needed.
5. Include diagrams showing clearances to utility lines and other encumbrances along route.
6. Include care and maintenance provisions and eventual removal of tree stabilization.

C. Pruning Schedule: Written schedule prepared by certified arborist (provided by contractor) detailing scope and extent of pruning for each tree in preparation for and subsequent to transplanting.

1. Species and size of plant.
2. Location on site plan. Include unique identifier for each.
3. Reason for pruning.
4. Seasonal limitations on pruning.
5. Preparatory Pruning: Time schedule and description of preparatory pruning to be performed.
   a. Indicate time in months preceding the extraction of the tree.
   b. Indicate diameter of root ball and depth of root pruning for each tree.
6. Description of root and crown pruning during and subsequent to transplanting.
7. Description of maintenance following pruning.

1.8 INFORMATIONAL SUBMITTALS

A. Certification: From arborist, certifying that transplanted trees have been protected during construction and that trees were promptly and properly treated and repaired when damaged.

B. Maintenance Recommendations: From arborist, recommended procedures to be established by Owner for care and protection of trees after completing the Work.

1. Submit before completing the Work.

C. Tree-Transplanting Program: Submit before work begins.

D. Sample Warranties: For special warranties.

E. Tree-maintenance reports.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or trees.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery with appropriate certificates.

C. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees in such a manner as to destroy their natural shape.

D. Completely cover foliage when transporting trees while they are in foliage.

E. Handle trees by root ball. Do not drop trees.

F. Move trees after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after moving, set trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify final grade elevations and final locations of trees and construction contiguous with trees by field measurements before proceeding with transplanting work. Perform transplanting only after finish grades are established.

B. Seasonal Restrictions: Transplant trees during the following in-season periods:

1. Fall: October -December
2. Winter: January - March

C. Weather Limitations: Proceed with transplanting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Do not transplant during excessively wet or frozen conditions. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

D. Tree and Landscape Protection: Refer to Section 015639 “Tree & Landscape Protection” for requirements of all work within Tree Protection Zones.

E. Coordination with Seeded Areas: Perform transplanting before Seeding and Mulching.

1.11 WARRANTY

A. Installer's Special Warranty: Tree-service firm agrees to repair or replace trees and related materials that fail within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Death and unsatisfactory growth except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
   b. Death and unsatisfactory growth is defined as more than 25 percent dead or in an unhealthy condition or failure to meet general performance requirements at end of warranty period.

c. Structural failures including trees falling or blowing over.
d. Faulty performance of materials and devices related to tree plantings including tree stabilization and watering devices.

2. Warranty Periods from Date of Substantial Completion:
   a. Trees: 12 months.
3. Include the following remedial actions as a minimum:
   a. Remove dead trees and trees with unsatisfactory growth at end of warranty period; replace when directed.
   b. A limit of one replacement of each tree will be required except for losses or replacements due to failure to comply with requirements.
   c. Replace materials and devices related to tree plantings.
   d. Provide extended warranty for period equal to original warranty period, for replaced trees.

1.12 MAINTENANCE SERVICE

A. Initial Maintenance Service: Provide tree maintenance by skilled employees of tree-service firm and as required in Part 3. Begin maintenance immediately after trees are installed and continue until plantings are healthy and well established but for not less than maintenance period below.

1. Maintenance Period: 12 months from date of transplanting completion Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Transplanted trees shall be healthy and resume vigorous growth within 6 months of transplanting without dieback due to defective extracting, handling, planting, maintenance, or other defects in the Work.

2.2 PLANTING MATERIALS

A. Backfill Soil: Planting soil of suitable moisture content and granular texture for placing and compacting in planting pit around tree, and free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

1. Topsoil as specified in Section 329113 "Soil Preparation."

2.3 MISCELLANEOUS PRODUCTS

A. Organic Mulch: Arbormulch as provided by County Parks Department.

B. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

C. Burlap: Non-synthetic, biodegradable.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. For the record, prepare written report, endorsed by arborist, listing conditions detrimental to transplanting work and tree protection and health.

C. Proceed with transplanting only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, other facilities, turf areas, and other plants and planting areas from damage caused by transplanting operations.

B. Utility Locator Service: Notify utility locator service for area where Project is located before beginning excavation.

C. Locate and clearly identify trees for transplanting. Flag each tree at 54 inches above the ground.

D. Lay out individual transplant locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before transplanting. Make minor adjustments as required.

E. Apply antidesiccant to trees uniformly, using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during extracting, handling, and transportation.

1. If deciduous trees are moved in full leaf, spray with antidesiccant before extracting and again two weeks after transplanting.

F. Wrap trees with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during extracting, handling, and transporting.

3.3 PREPARATORY PRUNING

A. Root Pruning: Perform preparatory root pruning under direction of arborist as far in advance of extracting each tree as the Project Schedule allows.

1. Dig exploratory pits or trench by hand or with air spade around perimeter of tree at indicated root-ball width to determine locations of main lateral roots.

2. Dig trench by hand or with tree spade around perimeter of tree at indicated root-ball width to the depth of the root system. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
3. Root-Ball Width: As determined by the Tree Transplant Firm and Arborist.
4. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking.
5. Use narrow-tine spading forks to comb soil to expose roots with minimal damage to root system.
6. Cut exposed roots manually with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
7. Do not paint or apply sealants on cut root ends.
8. Backfill trench with excavated soil.

B. Crown Pruning (Tip Pruning):

1. Perform preparatory crown pruning as directed by arborist.

3.4 EXCAVATION AND PLANTING EQUIPMENT

A. Tree Spade: Track-mounted mechanized tree mover; sized according to manufacturer's size recommendation for each tree being transplanted.

3.5 EXCAVATING PLANTING PITS

A. General: Excavate under supervision of the arborist.

1. Excavate planting pits or trenches with sides sloping. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil. Scarify sides of planting pit smeared or smoothed during excavation.
2. Excavate approximately two times as wide as root ball.
3. Keep excavations covered or otherwise protected until replanting trees.

B. Subsoil and topsoil removed from excavations may be used as planting soil.

C. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.

D. Seepage: Notify Architect if subsoil conditions evidence unexpected water seepage into tree-planting pits.

E. Drainage: Fill planting pit or trench with 6 inches of water and time the infiltration rate of the soil. If the drainage rate is less than 0.25 inch per hour, notify Landscape Architect to determine need for subsurface drainage.

3.6 EXTRACTING TREES

A. General: Extract trees under supervision of the arborist.

B. Orientation Marking: Mark the north side of each tree with non-permanent paint before extracting.

C. Root-Ball Width: Root-Ball Width: As determined by the Tree Transplant Firm and Arborist.

D. Root-Ball Depth: As determined by the arborist for each species and size of tree and for site conditions at original and planting locations.

E. Digging:

1. Dig and clear a pit by hand or with tree spade to the depth of the root system. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Use narrow-tine spading forks to comb soil to expose roots with minimal damage to root system.
3. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking.
4. Cut exposed roots manually with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not paint or apply sealants on cut root ends.
5. Construct box tight against root system sides and bottom as pit is dug. Brace and support box to prevent breaking of root ball.
6. Temporarily support and protect exposed roots from damage until they are permanently redirected and covered with soil. Cover roots with burlap and keep them moist until planted.

F. Extracting with Tree Spade: Use the same tree spade to extract the tree as will be used to transport and plant the tree.

1. Do not use tree spade to move trees larger than the manufacturer's maximum size recommendation for the tree spade being used.
2. When extracting the tree, center the trunk within the tree spade and move tree with a solid ball of earth.

3.7 PLANTING

A. Planting Standard: Perform planting according to ANSI A300 (Part 6) unless otherwise indicated.

B. Before planting, verify that root flare is visible at top of root ball. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

C. Ensure that root flare is visible after planting.

D. Remove injured roots by cutting cleanly; do not break. Do not paint or apply sealants on cut root ends.

E. Orientation: Position the tree so that its north side, marked before extracting, is facing north in its new location.

F. Set tree plumb and in center of planting pit with bottom of root flare 3" above adjacent finish grades.

1. Use specified backfill soil for backfill.
2. If area under the tree was initially dug too deep, add backfill to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
3. After placing some backfill around root ball to stabilize plant, begin backfilling.
4. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
5. Redirect exposed root ends downward in backfill areas where possible. Hand-expose roots as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning.
6. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended by arborist. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
7. Continue backfilling process. Water again after placing and tamping final layer of soil.

G. Watering Pipe: During backfilling, install watering pipe 4 feet deep into the planting pit outside the root ball as indicated on Drawings and Specifications.

H. Planting with Tree Spade: Use the same tree spade for planting as was used to extract and transport the tree. Do not use tree spade for trees larger than the manufacturer's maximum size recommendation for the tree spade being used.

I. Slopes: When planting on slopes, set the tree so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.8 CROWN PRUNING

A. Prune branches as directed by arborist.

1. Prune to remove only injured, broken, dying, or dead branches. Do not prune for shape.
2. Do not remove or reduce living branches to compensate for root loss caused by cutting root system or to improve natural tree form.
3. Pruning Standards: Perform pruning according to ANSI A300 (Part 1).

B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.

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

D. Do not paint or apply sealants to wounds.

E. Provide subsequent maintenance during Contract period as recommended by arborist.

3.9 MULCHING

A. Organic Mulch: Apply 3-inch average thickness of organic mulch extending beyond edge of individual planting pit and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 6 inches of trunks or stems.

3.10 INSTALLING SLOW-RELEASE WATERING DEVICE

A. Provide one device for each tree.

B. Place device on top of the mulch at base of tree and fill with water according to manufacturer's written instructions.

3.11 TREE MAINTENANCE

A. Perform tree maintenance as recommended by arborist. Maintain arborist observation of transplanting work.

B. Maintain trees by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Treat as required to keep trees free of insects and disease.

C. From time of preparatory root pruning or tree extraction measure soil moisture adjacent to edge of each root ball weekly. Record findings and weather conditions.

D. Fill areas of soil subsidence with backfill soil. Replenish mulch materials damaged or lost in areas of subsidence.

E. Apply treatments as required to keep tree materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

F. Reports: Have arborist prepare monthly inspection reports.

3.12 REPAIR AND REPLACEMENT

A. General: Repair or replace transplanted trees and other plants indicated to remain or be relocated that are damaged by construction operations, in a manner recommended by the arborist and approved by Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that the Landscape Architect determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size as those being replaced for each tree of 6 inches or smaller in caliper size. For any trees larger than 6 inches in caliper provide a 6 inch caliper replacement tree.
2. Species of Replacement Trees: Same species being replaced.

3.13 CLEANUP AND PROTECTION

A. During transplanting, keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect trees from damage due to transplanting operations and operations of other contractors and trades. Maintain protection during transplanting and maintenance periods. Treat, repair, or replace damaged plantings.

C. After planting and before Substantial Completion, remove tags, markings, tie tape, labels, wire, burlap, and other debris from transplanted trees, planting areas, and Project site.

3.14 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Except for materials indicated to be recycled, remove surplus soil, excess excavated material, waste materials, displaced plants, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Except for materials indicated to be retained on Owner's property or recycled, remove excess excavated material, waste materials, displaced plants, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 329600

SECTION 331900

WATER SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Site water distribution system for domestic and fire protection services up to 5 feet of any on-site building being served.

B. Domestic water and fire protection water transmission or distribution system within a roadway or street right-of-way.

1.2 RELATED SECTIONS

A. Section 312100, Utility Trenching and Backfill

B. Section 312000, Earthwork

1.3 RELATED DOCUMENTS

A. ASME

1. ASME A112.1.2: Air Gaps in Plumbing Systems (for Plumbing Fixtures and Water Connect Receptors
2. ASME B1.20.1: Pipe Threads, General Purpose, Inch
3. ASME B16.1: Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250
4. ASME B16.18: Cast Copper Alloy Solder Joint Pressure Fittings
5. ASME B16.22: Wrought Copper and Copper Alloy Solder – Joint Pressure fittings
6. ASME B16.26: Cast Copper Alloy Fittings for Flared Copper Tubes

B. ASTM

1. ASTM A536: Standard Specification for Ductile Iron Castings
2. ASTM A674: Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids
3. ASTM B61: Standard Specification for Steam or Valve Bronze Castings
4. ASTM B62: Standard Specification for Composition Bronze or Ounce Metal Castings
5. ASTM B88: Standard Specification for Seamless Copper Water Tube
6. ASTM C94: Standard Specification for Ready-Mixed Concrete
7. ASTM D1785: Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
8. ASTM D2564: Standard Specification for Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Piping Systems
9. ASTM F1056: Standard Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings

C. AWWA

1. C104: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
2. C105: Polyethylene Encasement for Ductile-Iron Pipe Systems
3. C110: Ductile-Iron and Gray-Iron Fittings
4. C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
5. C115: Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
6. C116: Protective Fusion-Bonded Epoxy Coatings for the Interior & Exterior Surfaces for Ductile-Iron and Gray-Iron Fittings
7. C150: Thickness Design of Ductile-Iron Pipe
8. C151: Ductile-Iron Pipe, Centrifugally Cast
9. C153: Ductile-Iron Compact Fittings
10. C200: Steel Water Pipe 6 inch and larger
11. C203: Coal-Tar Protective Coatings and Linings for Steel Water Pipe
12. C205: Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 inch and Larger-Shop Applied
13. C207: Steel Pipe Flanges for Waterworks Service-Sizes 4 inch through 144 inch
14. C208: Dimensions for Fabricated Steel Water Pipe Fittings
15. C209: Cold Applied Tape Coatings for Steel Water Pipe, Special Sections, Connections, and Fittings
16. C210: Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings
17. C213: Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings
18. C214: Tape Coatings for Steel Water Pipelines
19. C218: Liquid Coatings for Aboveground Steel Water Pipe and Fittings
20. C219: Bolted, Sleeve-type Couplings for Plain-End Pipe
21. C500: Metal-Seated Gate Valves for Water Supply Service
22. C502: Dry-Barrel Fire Hydrants
23. C503: Wet Barrel Fire Hydrants
24. C504: Rubber Seated Butterfly Valves.
25. C507: Ball Valves, 6 inch through 60 inch.
26. C508: Swing-check Valves for Waterworks Service, 2 inch through 48 inch NPS.
27. C509: Resilient-Seated Gate Valves for Water Supply Service
28. C510: Double Check Valve Backflow Prevention Assembly
29. C511: Reduced-Pressure Principle Backflow Prevention Assembly
30. C512: Air-Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service
31. C550: Protective Interior Coatings for Valves and Hydrants
32. C600: Installation of Ductile-Iron Water Mains and Their Appurtenances
33. C606: Grooved and Shouldered Joints
34. C651: Disinfecting Water Mains
35. C800: Underground Service Line Valves and Fittings
36. C900: Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 inch through 60 inch for Water Transmission and Distribution
37. C901: Polyethylene (PE) Pressure Pipe and Tubing, ½ inch through 3 inch for Water Service
38. C905: Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 inch through 48 inch for Water Transmission and Distribution
39. C906: Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 65 inch, for Waterworks
40. M11: Steel Pipe - A Guide for Design and Installation
41. M23: PVC Pipe – Design and Installation

42. M41: Ductile-Iron Pipe and Fittings

D. Factory Mutual Insurance Company (FM)

1. FM 1530: Fire Department Connections

E. National Fire Protection Association (NFPA)

1. NFPA 24: Installation of Private Fire Service Mains and Their Appurtenances
2. NFPA 70: National Electric Code
3. NFPA 1963: Fire Hose Connection

F. National Sanitation Foundation (NSF)

1. NSF 61: Drinking Water System Components-Health Effects

G. Underwriters Laboratory(UL)

1. UL 262: Safety Gate Valves for Fire-Protection Service
2. UL 405: Safety Fire Department Connection Devices
3. UL 789: Indicator Posts for Fire-Protection Service

1.4 DEFINITIONS

A. AASHTO: American Association of State Highway and Transportation Officials

B. ASTM: American Society for Testing Materials

C. AWWA: American Waterworks Association

D. DI: Ductile iron

E. DIP: Ductile iron pipe

F. FM: Factory Mutual

G. NFPA: National Fire Protection Association

H. NSF: National Sanitation Foundation

I. PCC: Portland cement concrete

J. PE: Polyethylene

K. PVC: Polyvinyl Chloride

L. UL: Underwriters Laboratory

1.5 SYSTEM PERFORMANCE REQUIREMENTS

A. Minimum Working Internal Pressures: 60 psi static, 20 psi residual.

B. External Load: Earth load indicated by depth of cover plus AASHTO H20 live load unless indicated otherwise.

1.6 SUBMITTALS

A. Product Data: Manufacturer's literature and data, including, where applicable, sizes, pressure rating, rated capacity, listing/approval stamps, labels, or other marking on equipment made to the specified standards for materials, and settings of selected models, for the following:

1. Piping materials and fittings
2. Gaskets, couplings, sleeves, and assembly bolts and nuts
3. Flexible pipe fittings
4. Restrained pipe fittings
5. Flexible Connectors
6. Expansion joints
7. Flexible expansion joints
8. High deflection fittings/ball joints
9. Gate valves
10. Butterfly valves
11. Check valves
12. Ball valves
13. Air release, air/ vacuum and combination air valves
14. Blow-off valves
15. Pressure reducing valves
16. Flow Regulating valves
17. Service connections and water meters
18. Valve boxes, meter boxes, frames and covers
19. Backflow preventers
20. Fire hydrants
21. Post indicator valves
22. Fire department connections
23. Thrust block concrete mix
24. Tapping sleeves and tapping valves
25. Service saddles and corporation stops
26. Identification materials and devices

B. Shop Plans and Calculations: Where an on-site fire water system is required, Contractor shall provide shop plans for Engineer and agency approval prior to construction. Coordinate with the Plans and identify any proposed modifications or deviations. Shop Plans and Calculations shall be stamped and signed by a registered Fire Protection Engineer licensed by the State of California as required.

1. Include the following information:

a. Design assumptions
b. Thrust block sizing and calculations
c. Materials to be used
d. Available water pressure
e. Required water pressure

2. The review of fire system components constitutes only a portion of the review and approval required. A copy of the fire system component submittal package shall be forwarded to the local fire marshal for further review and approval.

C. Shop drawings: Include plans, elevations, details and attachments.

1. Precast and cast in-place vaults and covers
2. Wiring diagrams for alarm devices

D. Field test reports: Indicate and interpret test results for compliance with the Project requirements.

1.7 QUALITY ASSURANCE

A. Comply with requirements of utility supplying water. Do not operate existing valves or tap existing piping without written permission and/or presence of utility company representative.

B. Comply with the following requirements and standards:

1. NSF 61: “Drinking Water System Components-Health Effects” for materials for potable water.
2. NFPA 24: “Installation of Private Fire Service Mains and Their Appurtenances” for materials, installations, tests, flushing, and valve and hydrant supervision.
3. NFPA 70: “National Electric Code” for electrical connections between wiring and electrically operated devices.

C. Provide listing/approval stamp, label, or other marking on piping and specialties made to a specified standard.

1.8 MATERIAL DELIVERY, STORAGE AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage and handling to prevent pipe end damage and to prevent entrance of dirt, debris and moisture.

C. Handling: Use slings to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. During Storage: Use precautions for valves, including fire hydrants according to the following.

1. Do not remove end protectors, unless necessary for inspection, then reinstall for storage.
2. Protection from Weather: Store indoors and maintain temperature higher than ambient dew-point temperature. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

E. Do not store plastic pipe and fittings in direct sunlight.

F. Protect pipe, fittings, flanges, seals and specialties from moisture, dirt and damage.

G. Protect linings and coatings from damage.

H. Handle precast boxes, vaults and other precast structures according to manufacturer's written instructions.

I. Protect imported bedding and backfill material from contamination by other materials.

1.9 COORDINATION

A. Coordinate connection to existing water mains with water utility supplying water.

B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building domestic water distribution piping and fire protection piping.

PART 2 - PRODUCTS

2.1 PVC PIPE: SIZES 1/8 INCH THROUGH 6 INCH

A. Pipe and Fittings: ASTM D1785, Schedule 40.

B. Joints: Restrain with solvent cement. Do not use threaded pipe.

C. Solvent Cement: ASTM D2564.

2.2 DIP: SIZES 6 INCH THROUGH 48 INCH

A. Pipe: Pressure Class 200 pipe conforming to AWWA C151, AWWA Manual M41 and standard thickness per AWWA C150. U.S. Pipe, American Cast Iron Pipe Company, or approved equal.

B. Fittings: Provide fittings with pressure rating greater than or equal to that of the adjoining pipe.

C. Pipe and Fitting Lining: Cement Mortar, AWWA C104.

D. Pipe and Fitting Coating: Asphaltic, AWWA C151 or C115.

E. Fittings

1. Standard: AWWA C110, sizes 4 inch through 48 inch.
2. Compact: AWWA C153, sizes 4 inch through 24 inch.
3. All fittings shall be fusion epoxy coated per AWWA C116.

F. Exterior Soil Corrosion Protection for Pipe and Fittings: Polyethylene encasement, AWWA C105.

G. Restrained Joints:

1. Flanged Joint: Provide bolts, nuts, and gaskets in conformance with AWWA C115. Gaskets shall conform to the requirements specified in AWWA C111. Unless otherwise required, above ground flange assembly bolts shall be standard hex-head, cadmium plated machine bolts with American Standard Heavy, hot–pressed, cadmium plated hexagonal nuts. Buried flange nuts and bolts shall be as above except they shall be of Type 304 stainless steel.
2. Push-On Bell and Spigot Joint: Provide shape of pipe ends and fitting ends, gaskets, and lubricant for joint assembly conforming to AWWA C111 with "Field Lok Gasket," sizes 4 inch through 24 inch, "TR Flex," sizes 4 inch through 64 inch; both by U. S. Pipe, or approved equal. "Megalug" restraint harness, EBAA Iron, or approved equal.
3. Mechanical Joint: Pressure rating of 350 psi. Dimensional and material requirements for pipe ends, glands, bolts and nuts, and gaskets shall conform to AWWA C111 with "Megalug," sizes 3 inch through 48 inch, EBAA Iron, or approved equal.
4. Grooved and Shouldered Joints: AWWA C150, AWWA C151 and AWWA C606. 24 inch maximum size.

H. Insulating Joints:

1. Provide a rubber-gasketed or other suitable approved type of insulating joint or dielectric coupling which will effectively prevent metal-to-metal contact at the joint between adjacent sections of dissimilar metals.
2. Provide joint of the flanged type with insulating gasket, insulating bolt sleeves, and insulating washers.
3. Provide gasket of the dielectric type, full face, as recommended in AWWA C115.
4. Provide bolts and nuts as recommended in AWWA C115.

I. Couplings:

1. Plain End Pipe to Plain End Pipe: Ductile iron or steel bolted couplings, manufacturer's shop coating with low alloy steel bolts and nuts. Steel couplings to conform to AWWA C219. Stainless steel bolts and nuts and special coatings available for extra protection from corrosion. Smith-Blair, Inc., Dresser, or approved equal.
2. Plain End Pipe to Flanged Pipe: 1) Ductile iron or steel bolted flanged coupling adapters, manufacturer's shop coating with low alloy steel bolts and nuts. Steel flanged couplings to conform to AWWA C219. Stainless steel bolts and nuts and special coatings available for extra protection from corrosion. Smith-Blair, Inc., Dresser, or approved equal., or 2) restrained flange adapter, "Megaflange," sizes 3 inch through 48 inch, EBAA Iron, or approved equal.

2.3 FLEXIBLE CONNECTORS

A. Flanged Coupling Adapters for plain end pipe at fittings, valves and equipment shall be Dresser Style 127 or 128, similar models by ITT; Baker Coupling Company or approved equal. Nuts, bolts and other hardware shall be Type 304 stainless steel.

B. Mechanical Couplings shall be rated for a minimum working pressure of 150 psi. The barrel shall be a minimum 10 inches long. Couplings shall be cleaned and shop primed with manufacturer's standard rust inhibitive primer. Mechanical couplings shall be Smith-Blair, Romac, JCM, Apac or approved equal, with stainless steel nuts, bolts, and threaded rods.

C. Flexible Coupling for Steel Pipe shall be Dresser Coupling Style 38 with EPDM gaskets, or approved equal.

2.4 FLEXIBLE EXPANSION JOINTS

A. Flexible expansion joints shall be installed at locations indicated on the Plans and shall be manufactured of ductile iron conforming to the material requirements of ASTM A536 and AWWA C153.

B. Each flexible expansion joint shall be pressure tested prior to shipment against its own restraint to a minimum of 250 psi. A minimum 2:1 safety factor, determined from the published pressure rating, shall apply.

C. Each flexible expansion joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of 15º, and 6 inches minimum expansion. The flexible expansion fitting shall not expand or exert an axial imparting thrust under internal water pressure. The flexible expansion fitting shall not increase or decrease the internal water volume as the unit expands or contracts.

D. All internal surfaces (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of AWWA C213. Sealing gaskets shall be constructed of EPDM. The coating and gaskets shall meet ANSI/NSF-61.

E. Exterior surfaces shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of AWWA C116

F. Polyethylene sleeves, meeting AWWA C105, shall be included for direct buried applications.

G. Flanged or mechanical Joint: Flexible expansion joint shall be Force Balanced FLEX-TEND, sizes 3 inch through 48 inch, as manufactured by EBAA Iron, or approved equal.

H. Flanged Joint: Starflex, Series 5000, Star Pipe Products, or approved equal.

I. Plain End to Plain End Pipe: “Xtra Flex,” sizes 4 inch through 24 inch, U. S. Pipe, or approved equal.

2.5 HIGH DEFLECTION FITTINGS/BALL JOINTS

A. Plain End Pipe: Xtra Flex Restrained Joint High Deflection Fittings, 4 inch through 24 inch, U. S. Pipe, or approved equal.

B. Mechanical or Flanged Joint: Flex 900, 4 inch through 12 inch, EBAA Iron, or approved equal.

2.6 GATE VALVES

A. Provide valves conforming to AWWA C500 or AWWA C509

B. Valves shall be resilient-seated, with non-rising stem, gray or ductile-iron body and bonnet, with bronze or gray or ductile-iron gate, bronze stem and square stem operating nut unless noted otherwise.

C. [Metal seated, AWWA C500, and rubber seated, AWWA C504, are also available.]

D. All bolts, nuts and washers, except operating nut, shall be stainless steel.

E. Stem operating nut to be 2 inches square and open counter-clockwise.

F. Stem extensions shall be installed to bring the stem operating nut to within 2 feet of finish grade where the depth from finish grade to the stem operating nut exceeds 4 feet.

G. Equip valves in pump stations and other interior or vault installations with hand-wheels.

H. Provide protective epoxy interior and exterior coating according to AWWA C550 and manufacturer's recommendations.

I. For the domestic water system, valves shall also conform to NSF 61.

J. Service line Valves and fittings, 2 inch and smaller shall be in accordance with AWWA C800

K. Where a post indicator is shown, provide valve with an indicator post flange.

L. 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. Mueller Company
2. M&H Valve Company
3. Crane Company, or approved equal

2.7 SWING CHECK VALVES

A. Provide swing-check type valves conforming to AWWA C508.

B. 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. Mueller Company
2. M&H Valve Company
3. DeZurik/APCO
4. Watts, or approved equal

2.8 BALL VALVES

A. Provide ball valves (6 inch through 48 inch) per AWWA C507 as manufactured by Crane Company, or approved equal.

B. Provide ball valves (2 inches and smaller) conforming to AWWA C800 as manufactured by Mueller 300 Series, Ford, or approved equal.

C. Valves shall open by counterclockwise rotation of the valve stem.

D. Provide valves with ends as appropriate for the adjoining pipe.

E. Provide valve with lockable operating nut or handle as shown on the Plans.

2.9 AIR RELEASE, AIR/VACUUM AND COMBINATION AIR VALVES

A. Air release and vacuum valves: Provide valve and service size as shown on the Plans. Valve shall have cast-iron single valve body, and shall conform to AWWA C512. A compound lever system shall have a maximum operating pressure of 300 psi. Provide a protective cap for the outlet of the valve. Provide universal air-vacuum type valves, Crispin, DeZurik/APCO or approved equal.

B. Combination air valves: Provide valve and service size as shown on the Plans. Valve shall have cast-iron single valve or double valve body, and shall conform to AWWA C512. A simple or compound lever system shall have a maximum operating pressure of 300 psi. Provide a protective cap for the outlet of the valve.

C. 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. Crispin
2. DeZurik/APCO, or approved equal

2.10 BLOW-OFF VALVES

A. Provide valve and service size as shown in the Plans. Provide 2-inch valves at low points of the piping system, and 4 inch valves at dead-ends of the piping system, unless otherwise directed by the Engineer.

B. 2-inch blow-off shall have a 2-inch vertical female iron pipe (FIP) inlet and a 2-inch normal pressure and temperature (NPT) nozzle outlet with cap. Valve shall open by counterclockwise rotation of a top-mounted 9/16-inch square operating nut. All working parts shall be serviceable without excavation. Kupferle/Truflo Model TF550, or approved equal.

C. 4-inch blow-off shall have all brass principal working parts, 4-inch inlet and outlet and is self-draining and non-freezing. Valve shall open by counterclockwise rotation of a top-mounted 2-inch square operating nut. All working parts shall be serviceable without excavation.

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:

E. Kupferle/ MainGuard #7600, or approved equal

2.11 PRESSURE-REDUCING VALVES

A. Valve: Automatic, pilot-operated, cast-iron body with interior coating according to AWWA C550. 250 psi working-pressure, bronze pressure-reducing pilot valve and tubing, and means for discharge pressure adjustment.

B. Valves shall have flanged ends. Valves sized 3 inches or smaller may have screwed ends.

C. 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. Cla-Val Company
2. Bermad
3. Ames Company, or approved equal

2.12 SERVICE CONNECTIONS AND WATER METERS

A. Coordinate with Menlo Park for water service connection and water meters. The City to provide meter, water service line, and tap to water main depending on pipe material. Refer to Menlo Park Municipal Water Connection Guidelines.

2.13 VALVE BOXES, METER BOXES, FRAMES AND COVERS

A. Water Valve Box: Provide pre-cast concrete valve box for each buried valve. Provide box with steel or cast iron traffic cover marked "WATER". Christy Model G5 with G5C cover or approved equal.

B. Valve or Meter Boxes: Contractor shall verify box size required for water system appurtenances as shown in the Construction Documents. Provide a precast concrete utility box for each buried appurtenance. Provide a traffic-rated lid for H20 loading. A non-traffic rated lid may be used for boxes located in landscape areas. Christy, or approved equal.

2.14 BACKFLOW PREVENTER - REDUCED PRESSURE PRINCIPLE ASSEMBLIES (RPPA)

A. Provide RPPA consisting of two independently operating check valves with a pressure differential relief valve located between the two check valves, two shut-off valves and four test cocks. RPPA shall be tamper-proof and conform to AWWA C511. Valve shall have an outside screw (OS) gate valve on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air gap fitting located between 2 positive-seating check valves for continuous-pressure application.

B. Body:

1. 2 inch and Smaller: Bronze with threaded ends
2. 2 ½ inch and Larger: Bronze, cast iron steel, or stainless steel with flanged ends

C. Interior Lining: AWWA C550, epoxy coating for cast iron or steel bodies

D. Interior Components: Corrosion-resistant materials

E. 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. Cla-Val Company
2. Ames Company
3. Febco, CMB Industries, Inc.
4. Hersey Products, Inc.
5. Watts

6. Zurn/Wilkins, or approved equal

F. Backflow prevention assemblies must be approved by the University of Southern California Foundation for Cross-Connection Control, installed per City Standards, tested by an approved backflow prevention tester listed on the San Mateo County Environmental Health Service's list of Certified Backflow Prevention Testers, and identified with a County tag. Assemblies must be tested by owner upon installation and annual thereafter.

2.15 BACKFLOW PREVENTER - DOUBLE CHECK DETECTOR ASSEMBLY (DCDA)

A. Provide a cast-iron body DCDA consisting of mainline double check assemblies in parallel with a bypass double check and meter assembly, two shut-off valves and four test cocks. DCDA shall be tamper-proof and conform to AWWA C510. FM approved or UL listed, with outside screw and yoke (OS&Y) gate valve on inlet and outlet, and strainer on inlet. Include two positive-seating check valves and test cocks, and bypass with displacement-type water meter, valves, and double-check backflow preventer, for continuous pressure application.

B. 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. Cla-Val Company
2. Ames Company
3. Febco, CMB Industries, Inc.
4. Hersey Products, Inc.
5. Zurn/Wilkins, or approved equal

C. Backflow prevention assemblies must be approved by the University of Southern California Foundation for Cross-Connection Control, installed per City Standards, tested by an approved backflow prevention tester listed on the San Mateo County Environmental Health Servie's list of Certified Backflow Prevention Testers, and identified with a County tag. Assemblies must be tested by owner upon installation and annual thereafter.

2.16 POST INDICATOR VALVE

A. General: UL 789, FM approved, vertical-type, cast-iron body with operating wrench extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve.

B. 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. Mueller Company
2. Clow Corporation
3. American Cast Iron Company

2.17 FIRE DEPARTMENT CONNECTION

A. Exposed, sidewalk or Freestanding Type Fire Department Connection: UL 405, cast brass body with threaded inlets according to NFPA 1963 and matching local fire department hose threads and threaded bottom outlet. Include lugged caps, gaskets and chains; lugged swivel connections

and drop clapper for each hose-connection inlet; 18-inch high brass sleeve; and round escutcheon plate. Number of inlets shall be as shown on the Plans. Clapper and spring check inlets shall each have a minimum capacity of 250 gpm, and be furnished with a cap and chain. Outlet shall be sized for simultaneous use of all inlets. Connection shall be branded "Building XX".

1. 2-Way FDC: Connection shall conform to UL 405 or FM 1530. Elkhart, Croker, or approved equal.
2. 3-Way FDC: Connection shall be subject to approval by the local water department or fire marshal. Elkhart, Croker, Potter-Roemer or approved equal.
3. 4-Way FDC: Connection shall conform to UL 405. Potter-Roemer, Croker, or approved equal.
4. 6-Way FDC: Connection shall be subject to approval by the local water department or fire marshal. Croker, Potter-Roemer or approved equal.

2.18 FIRE HYDRANTS

A. Provide two 2 ½ inch and one 4 ½ inch outlets, with a 6-inch nominal inside diameter inlet and break-away type bolts. Hydrant shall have a working pressure of 250 psi and shall conform to AWWA C503, and be UL listed and FM approved. Provide hydrants of one manufacturer. Clow model 960 series or approved equivalent, subject to approval of the Owner and fire marshal.

2.19 SERVICE SADDLES AND CORPORATION STOPS

A. Service Saddles: Saddles shall conform to AWWA C800 and NSF 61.

1. For DIP: Provide bronze or stainless steel body, double strap type with a 200 psi maximum working pressure. Mueller BR2 Series, Ford, or approved equal.
2. For PVC: Provide bronze body, wide strap type. Mueller H-13000 Series, Ford, or approved equal.
3. For PE: Per manufacturer's recommendations.

B. Corporation Stops: Provide ground key type; bronze conforming to ASTM B61 or ASTM B62, for a working pressure of 100 psi and suitable for the working pressure of the system.

1. Ends shall be suitable for adjoining pipe and connections, solder-joint, or flared tube compression type joint.
2. Threaded ends shall conform to AWWA C800.
3. Coupling nut for connection to flared copper tubing shall conform to ASME B16.26.
4. Mueller H-15000 Series with "CC" threads and a copper flare straight connection outlet, Ford, or approved equal.

2.20 IDENTIFICATION MATERIALS AND DEVICES

A. Warning Tape: Provide warning tape consisting of metallic foil bonded to solid blue plastic film not less than 3 inches wide. Film shall be inert polyethylene plastic. Film and foil shall each not be less than 1 mil thick. The tape continuously shall have printed black-letter, not less than ¾ inch high, message reading "CAUTION: WATER MAIN BELOW".

B. Tracer Wire for Nonmetallic Piping: Provide 12 guage, coated copper or aluminum wire not less than 0.10 inch in diameter, with blue THW, THWN, or THHN rated insulation, in sufficient

length to be continuous over each separate run of nonmetallic pipe. Wire shall be tied in at all valves.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION

A. Pipe Depth and Trench Configuration: Conform to elevations, profiles and typical trench section(s) shown on the Plans.

B. Excavation, Bedding, Backfill, and Compaction: Section 312100 – Utility Trenching and Backfill.

C. 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.

D. Pipe laying and jointing:

1. Provide proper facilities for lowering sections of pipe into trenches.
2. Do not drop or dump pipe, fittings, valves, or any other water line material into trenches.
3. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace any pipe or fitting that does not allow sufficient space for proper installation of jointing material.
4. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying.
5. Grade the pipeline in straight lines; avoid the formation of dips and low points.
6. Support pipe at proper elevation and grade.
7. Provide secure firm, uniform support. Wood support blocking will not be permitted.
8. Lay pipe so that the full length of each section of pipe and each fitting rests solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.
9. Provide anchors and supports where indicated and where necessary for fastening work into place.
10. Make proper provision for expansion and contraction of pipelines.
11. Keep trenches free of water until joints have been properly made.
12. Do not lay pipe when conditions of trench or weather prevent proper installation.
13. All fittings shall be blocked with appropriately sized thrust blocks as shown on the Plans.

E. Installation of Tracer Wire:

1. Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe.
2. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.
3. Form a mechanically and electrically continuous line throughout the pipeline, extending to the nearest valve or other pipeline appurtenance. Extend the wire up the outside of the valve box/riser and cut a hole that is 8 inches from the top, extend a 12 inch wire lead to the inside of the box. At other pipeline appurtenances, terminate the 12 inch wire lead inside the enclosure.

4. Splice wire with a splicing device consisting of and electro-tin plated seamless copper sleeve conductor. Install as recommended by the manufacturer. Wrap splices and damaged insulation with electrician's tape.

F. Installation of Warning Tape

1. Install tape approximately 1 foot above and along the centerline of the pipe.
2. Where tape is not continuous, lap tape ends a minimum of 2 feet.

G. 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. If necessary, use shorter than the standard lengths of pipe to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.

H. Connections to Existing Lines:

1. Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line.
2. Make connections to existing lines under pressure in accordance with the recommended procedures of a manufacturer of pipe of which the line being tapped is made.

I. Closure: Close open ends of pipes and appurtenance openings at the end of each day's work or when work is not in progress.

3.2 INSTALLATION OF DUCTILE-IRON PIPING

A. Install pipe and fittings in accordance with requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

B. Jointing:

1. Provide push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly.
2. Provide mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and with the recommendations of AWWA C111.
3. Provide flanged joints with the gaskets, bolts, and nuts specified for this type joint.
4. Install flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other equipment and accessories.
5. Align bolt holes for each flanged joint.
6. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted.
7. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without over straining the flange.
8. Where flanged pipe and fitting have dimensions that do not allow the installation of a proper flanged joint as specified, replace it by one of proper dimensions.
9. Use setscrewed flanges to make flanged joints where conditions prevent the use of full-length flanged pipe. Assemble in accordance with the recommendations of the setscrewed flange manufacturer.

10. Provide insulating joints with the gaskets, sleeves, washers, bolts, and nuts previously specified for this type joint. Assemble insulating joints as specified for flanged joints. Bolts for insulating sleeves shall be full size for the bolt holes.
11. Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.

C. Exterior Protection: Completely encase buried ductile iron pipelines and underground appurtenances with polyethylene wrap. Install 8 mil linear low-density polyethylene (LLD) film or 4 mil high-density cross-laminated (HDCL) film per manufacturer's recommendations and in accordance with AWWA/ANSI C105/A21.5 and ASTM A674.

D. Pipe Anchorage: Provide concrete thrust blocks or restrained joints for pipe anchorage, except where metal harness is indicated on the Plans.

3.3 INSTALLATION OF POLYVINYL CHLORIDE PIPING

A. Comply with the recommendations for pipe installation, joint assembly and appurtenance installation in AWWA Manual M23.

B. Comply with the applicable requirements of AWWA C600 for joint assembly, and with the recommendations of Appendix A to AWWA C111.

C. Jointing:

1. Provide push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings.
2. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel.
3. For push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint.
4. Use an approved lubricant recommended by the pipe manufacturer for push-on joints.
5. Assemble push-on joints for connection to fittings, valves, and other accessories in accordance with the applicable requirements of AWWA C600 for joint assembly.
6. Make compression-type joints/mechanical-joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint. Cut off spigot end of pipe for compression-type joint or mechanical-joint connections and do not re-bevel.
7. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.

D. Pipe Anchorage:

1. Provide concrete thrust blocks or restrained joints for pipe anchorage, except where metal harness is indicated on the Plans.

3.4 INSTALLATION OF VALVES

A. Gate Valves

1. Install gate valves conforming to AWWA C500 and UL 262 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, operation, and Maintenance of Gate Valves) to AWWA C509.
2. Install gate valves conforming to AWWA C509 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, Operation, and Maintenance of Gate Valves) to AWWA C509.
3. Install gate valves on PVC water mains in addition in accordance with the recommendations for appurtenance installation in AWWA Manual M23.

B. Check Valves: Install check valves in accordance with the applicable requirements of AWWA C600 for valve-and-fitting installation, except as otherwise indicated.

C. Joints:

1. Valves on DI and PVC Pipe: Mechanical joint valves for buried locations. Flanged-end valves for installation in vaults/pits.

3.5 INSTALLATION OF VALVE AND METER BOXES

A. Boxes shall be centered over the appurtenance so as not to transmit shock or stress. Covers shall be set flush with the surface of the finished pavement, or as shown on the Plans. Backfill shall be placed around the boxes and compacted to the specified level in a manner that will not damage or displace the box from proper alignment or grade. Misaligned boxed shall be excavated, plumbed, and backfilled at no additional cost to the Owner.

3.6 INSTALLATION OF FIRE HYDRANTS

A. Install fire hydrants, except for metal harness, plumbed vertical, in accordance with AWWA C600 for hydrant installation and as indicated.

B. Provide and assemble joints as specified for making and assembling the same type joints between pipe and fittings. Hydrants shall be set so that mounting bolts clear the top of finished grade by three inches so bolts may be easily replace if needed.

C. Provide metal harness as specified under pipe anchorage requirements for the respective pipeline material to which hydrant is attached.

3.7 SERVICE LINE CONNECTIONS TO WATER MAINS

A. City to provide water meters, water service lines, and tap connection to water main depending on pipe material.

3.8 INSTALLATION OF BACKFLOW PREVENTERS

A. Backflow devices shall be installed horizontal and level, with three feet minimum clearances from obstructions.

3.9 ANCHORAGE INSTALLATION

A. Mechanically Restrained Joints: Install where indicated for lengths indicated in accordance with manufacturer's instructions.

B. PCC Thrust Blocks: Install where required and as indicated. Bearing area indicated is to be against undisturbed earth. Allow a minimum of 24 hours curing time before introducing water into the pipeline and allow a minimum of 7 days curing time before pressure testing.

3.10 CONNECTION TO EXISTING

A. City to provide connection to existing water main.

3.11 HYDROSTATIC PRESSURE AND LEAKAGE TEST

A. General:

1. Provide all necessary materials and equipment, including water.
2. Backfill all trenches sufficient to hold pipe firmly in position.
3. Allow time for thrust blocks to cure prior to testing.
4. Flush all pipes prior to testing to remove all foreign material.
5. Perform pressure and leakage test concurrently.
6. Apply test pressure by means of a pump connected to the pipe.
7. Base test pressure on the elevation of the lowest point in the line.
8. Fill each closed valve section or bulk-headed section slowly. Expel air from section being tested by means of permanent air vents installed at high points or by means of temporary corporation cocks installed at such points. Remove and plug the temporary corporation cocks at the conclusion of the test.
9. Ensure the release of air from the line during filling, and prevent collapse due to vacuum when dewatering the line.
10. The pressure test on mortar-lined pipe shall not begin until the pipe has been filled with water for at least 24 hours to allow for absorption in the cement mortar lining.
11. Allow the system to stabilize at the test pressure before conducting the leakage test.
12. Do not operate valves in either the opening or closing direction at differential pressures above the valves rated pressure.
13. Maintain test pressure as specified for type of pipe being tested.
14. Pressure Test: Examine any exposed pipe, fittings, valves, hydrants and joints during the test, if no leaks are observed the section of line has passed the pressure test. If leaks are observed, repair any damaged or defective pipe, fittings, valves, or hydrants, and repeat the pressure test.
15. Leakage Test: Perform as specified hereafter for the type of pipe being installed.
16. After installation of the water meter, contractor to test all backflow prevention assemblies and submit passing test results to water@menlopark.org within 48 hours. Failure to submit proof of successful testing will result in shutoff of the water service.

B. Preparation for Test

1. Vents shall be provided at the high points of the system and drains provided where means of venting or draining do not exist.

2. Remove or block off, all relief valves, rupture discs, alarms, control instruments, etc. that shall not be subjected to the test pressure.
3. All discs, balls, or pistons from check valves shall be removed if they interfere with filling of the system. Open all valves between inlet and outlet of the section to be tested.
4. Connect pump and provide temporary closures for all of the external openings in the system. Use caution to insure that the closures are properly designed and strong enough to withstand the test pressure.
5. A joint previously tested in accordance with this specification may be covered or insulated.
6. Expansion joints shall be provided with temporary restraint for additional pressure under test or shall be isolated from the test.
7. Flanged joints, where blanks are inserted to isolate equipment during the test, need not be tested.

C. DIP Leakage Test: Perform in accordance with AWWA C600. Selected requirements of AWWA C600 are repeated as follows:

1. The pipe shall be subjected to a hydrostatic pressure of 50 percent above the normal operating pressure, or 150 psi, whichever is greater. In no case shall the pressure be allowed to exceed the design pressure for pipe, appurtenances, or thrust restraints.
2. Maintain the test pressure, +/- 5 psi, for a minimum of four hours.
3. No piping will be accepted if the leakage is greater than that determined by the following formula:

$$L = (S \times D \times P1/2)/133{,}200$$

L = Allowable leakage, gallons per hour.
S = Length of pipe tested, feet.
D = Nominal diameter of pipe, inches.
P = Average test pressure during the leakage test, pounds per square inch (gauge).

D. PE Pipe Leakage Test:

1. The pipe shall be subjected to a hydrostatic pressure of 50 percent above the normal operating pressure, or 150 psi, whichever is greater. In no case shall the pressure be allowed to exceed the design pressure for pipe, appurtenances, or thrust restraints.
2. Apply the test pressure and allow the pipe to stand, without makeup pressure, for sufficient time to allow for diametric expansion or pipe stretching to stabilize, approximately two to three hours.
3. After the above stabilization has occurred, return the section being tested to the test pressure. Hold the test pressure for four hours. If the pressure in the test section drops, and it is determined the drop may be the result of expansion resulting from increasing temperature, a limited amount of additional water may be added to bring the pressure back to the test pressure. Allowable amounts of make-up water, to compensate for expansion due to increasing temperature, are as shown in the following table. Make-up water is only allowed during this final test period and not during the initial stabilization described in the previous paragraph. If the additional water added is less than the allowable shown in the table and there are no visual leaks or significant pressure drops, the tested section passes the test.

Nominal Pipe Size (in.)	Allowance for Expansion (U.S. Gals./100 Feet of Pipe) 1-Hour Test	2-Hour Test	3-Hour Test
3	0.10	0.15	0.25
4	0.13	0.25	0.40
6	0.30	0.60	0.90
8	0.50	1.0	1.50
10	0.75	1.3	2.1
11	1.0	2.0	3.0
12	1.1	2.3	3.4
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.2	4.3	6.5
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.9	13.3
28	5.5	11.1	16.8
32	7.0	14.3	21.5
36	9.0	18.0	27.0
40	11.0	22.0	33.0
48	15.0	27.0	43.0

E. PVC Pipe Leakage Test: Perform in accordance with AWWA M23. Selected requirements of AWWA M23 are repeated as follows:

1. The pipe shall be subjected to a hydrostatic pressure of 50 percent above the normal operating pressure, or 150 psi, whichever is greater. In no case shall the pressure be allowed to exceed the design pressure for pipe, appurtenances, or thrust restraints.
2. Maintain the test pressure, +/- 5 psi, for a minimum of four hours.
3. No piping will be accepted if the leakage is greater than that determined by the following formula:

$$L = (N \times D \times P1/2)/7{,}400$$

L = Allowable leakage, gallons per hour.
N = Number of joints in the length of the pipeline tested.
D = Nominal diameter of pipe, inches.
P = Average test pressure during the leakage test, pounds per square inch (gauge).

F. Cement Mortar Lined and Coated Steel Pipe Leakage Test: Perform in accordance with AWWA M11. Selected requirements of AWWA M11 are repeated as follows:

1. All pipelines shall be tested by subjecting each section to a pressure, measured at the lowest end of the section, of at least 150 percent of the class rating or design pressure of the pipe under test. In no case shall the pipe be tested at less than 150 psi, nor shall the pressure be allowed to exceed the design pressure for pipe, appurtenances, or thrust restraints.
2. Maintain the test pressure, +/- 5 psi, for a minimum of four hours.
3. There shall be no significant leakage for pipe with welded joints or mechanical couplings.

4. For pipe joined with O-ring rubber gaskets, a leakage of 25 gallons per inch of diameter per mile per 24 hours is allowed.

3.12 CLEANING

A. At the conclusion of the work, thoroughly clean all pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered the pipes during the construction period. Debris cleaned from the lines shall be removed from the low end of the pipeline. If after this cleaning, obstructions remain, they shall be removed. After the pipelines are cleaned and if the groundwater level is above the pipe or following a heavy rain, the Owner will examine the pipes for leaks. If any further defective pipes or joints are discovered, the Contractor shall repair them. Finished paving shall not be installed prior to completion of all cleaning and testing.

3.13 DISINFECTION OF PIPELINES

A. After completion of the hydrostatic test, the mains shall be thoroughly flushed with a minimum pipe velocity of 2.5 fps and chlorinated in accordance with the latest revision of AWWA 651, Standards of Disinfecting Water Mains. Any one of the methods therein described may be used, with the additional requirement of 50 ppm chlorination minimum initial application. At the end of the contact period, the mains shall again be flushed, and bacteriological samples taken.

B. If necessary, the Contractor shall provide, at his expense, outlets from which to take the samples. The location of the chlorination and sampling points will be determined by the Owner in the field. Taps for chlorination and sampling shall be installed. The Contractor shall uncover and backfill the taps as required.

C. Disinfection of tie-ins shall be performed by the Contractor by swabbing with chlorine or by other approved methods. Following a tie-in, the area affected by the tie-in shall be thoroughly flushed and bacteriological samples will be taken as deemed necessary.

D. All treated water flushed from the lines shall be dechlorinated and disposed of by discharging to the locations identified in the Plans, or by other approved means. No discharge of chlorinated water to any storm sewer or natural water course will be allowed, unless properly dechlorinated.

E. The Contractor shall rechlorinate and retest any lines that do not meet the requirements of the above testing. The line shall not be placed in service until the requirements of the State Public Health Department are met.

3.14 BACTERIOLOGICAL TESTING

A. Samples shall be gathered and tests conducted at the expense of the Contractor by a laboratory approved by the Owner.

B. Water samples are to be taken at representative points no less than one test per 500 feet of pipe, plus one test at each end of the pipe; or as required by the Owner.

C. After the samples have passed the bacteriological testing, the Contractor will be notified and arrangements can be made to make tie-ins and connections to house services.

D. Each water sample will have passed the bacteria tests if they show zero total coliform per 100 ml and not more than 50 non-sheen bacteria per 100 ml, and when the turbidity is no greater than the source water.

E. Samples shall be taken no sooner than 24 hours after final flushing.

F. Jumpers and/or plates shall be pulled within 14 days of the notification of a successful test, or new bacteria samples will have to be taken.

G. Follow-up bacteriological testing shall take place after tie-ins have been made, and shall meet the same passing requirements as the initial tests.

END OF SECTION 331900

SECTION 333000

SANITARY SEWER SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sanitary gravity sewers and force mains up to five feet from any on-site building

1.2 RELATED SECTIONS

A. Section 312100, Utility Trenching and Backfill

B. Section 033000, Cast-In-Place Concrete

1.3 RELATED DOCUMENTS

A. AASHTO
1. M199: Standard Specification for Precast Reinforced Concrete Manhole Sections
2. M252: Standard Specification for Corrugated Polyethylene Drainage Pipe
3. M294: Standard Specification for Corrugated Polyethylene Pipe, 12 to 60-inch Diameter

B. ASTM
1. A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
2. ASTM A674: Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids
3. C143: Standard Test Method for Slump of Hydraulic-Cement Concrete
4. C443: Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
5. C478: Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
6. C923: Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
7. C1173: Standard Specification for Flexible Transition Couplings for Underground Piping Systems
8. C1244: Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
9. D2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications
10. D3034: Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
11. D4101: Standard Specification for Propylene Injection and Extrusion Materials
12. F477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
13. F679: Standard Specification for Poly(Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings

14. ASTM F1056: Standard Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings
15. F1336: Standard Specification for Poly(Vinyl Chloride) (PVC) Gasket Sewer Fittings

C. AWWA
1. C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
2. C600: Installation of Ductile-Iron Water Mains and Their Appurtenances.
3. M23: PVC Pipe – Design and Installation

D. Caltrans Standard Specifications, 2015
1. Section 51, Concrete Structures
2. Section 65, Concrete Pipe
3. Section 75 Miscellaneous Metal
4. Section 90, Concrete

E. Federal Specification
1. SS-S-00210 (GSA-FSS)

1.4 DEFINITIONS

A. AASHTO: American Association of State Highway and Transportation Officials

B. ASTM: American Society for Testing Materials

C. AWWA: American Water Works Association

D. PVC: Polyvinyl Chloride

1.5 SUBMITTALS

A. Follow submittal procedure outlined in Division 1, General Requirements.

B. Product data for the following:
1. Piping materials and fittings
2. Special pipe couplings
3. Joint sealants
4. Cleanout plugs or caps
5. Sewage air relief valves

C. Shop drawings: Include plans, elevations, details and attachments for the following:
1. Precast concrete manholes, frames and covers
2. Precast concrete cleanout boxes and box covers
3. Force main piping access openings

D. Design Mix Reports and Calculations: For each class of cast in place concrete

E. Field Test Reports: Indicate test results for compliance with performance.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage
   1. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
   2. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

B. Handling
   1. Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. When handling lined pipe, take special care not to damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs. Carry, do not drag, pipe to trench.
   2. Handle precast concrete pipe, manholes and other precast structures according to manufacturer's written instructions.
   3. Protect imported bedding and backfill material from contamination by other materials.

PART 2 - PRODUCTS

2.1 PVC PIPE

A. Pipe:
   1. 4 inch through 15 inch: ASTM D3034, SDR 35
   2. 18 inch through 36 inch: ASTM F679, T-1 wall

B. Bell and spigot joints

C. Fittings:
   1. 4 inch through 27 inch: ASTM F1336
   2. 30 inch through 36 inch: ASTM D3034, SDR 35

D. Joint Gasket: Elastomeric seal, ASTM F477

E. Special Pipe Coupling: ASTM C1173. Rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined.

2.2 GRAVITY PIPE CLEANOUTS

A. Piping: Same as sanitary sewer line if possible

B. Top Cap: Threaded and of same material as piping if possible

C. Box Size: As required to provide access and allow easy removal and reinstallation of 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: "SANITARY SEWER" 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.
2. Brooks Products Inc.
3. Christy Concrete Products, Inc., or approved equal

2.3 MANHOLES

A. Manholes shall be pre-cast concrete of the size and shape shown on the Plans and shall conform to ASTM C478. Equivalent poured-in-place structures may be used at the Contractor's option. Concrete shall consist of Caltrans Type I/II cement. Rate for AASHTO H20 loading in traffic areas.

B. All interior concrete surfaces shall be coated with "Xypex Crystalline" or approved equivalent. Use of a water-resistant admix is acceptable, at Contractor option.

C. Frames and Covers: As indicated on the Plans. Manhole covers shall have the words "SANITARY SEWER" in letters not less than 2 inches cast into the cover. The clear opening for all manhole covers shall be 24 inches.

D. Frames and lids for manholes shall be match-marked in pairs before delivery to the job site. The lids shall fit into their frames without rocking.

E. Reinforcing Bars: Reinforcing bars shall be of intermediate grade billet steel conforming to ASTM A615 and shall be of the size shown on the Standard Details or in the Plans. Bars shall be of the round deformed type, free from injurious seams, flaws, or cracks, and shall be cleaned of all rust, dirt, grease and loose scales.

F. Portland Cement Concrete: Concrete for manhole bases, inlets, and other concrete structures shall conform to the requirements of Caltrans Standard Specifications Section 90 and as specified herein. The concrete shall be Class "A" containing six (6) sacks of portland cement per cubic yard of concrete. The grading of the combined aggregate shall be in accordance with the Caltrans requirements of the three-quarter inch maximum. The consistency of the concrete shall be such that the slump does not exceed four inches, as determined by ASTM C143. The concrete shall have a minimum design compressive strength of 3,000 psi after 28 days.

2.4 JOINT SEALANT FOR STRUCTURES AND MANHOLES

A. Mortar: Caltrans Standard Specification Section 51-1.02F
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 C443

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 Henry Company, or equal

2.5 SERVICE LATERAL RECONNECTIONS

A. Service lateral reconnections shall be made using a PVC SDR 35 45-degree Wye; sized to fit the sewer main and the diameter of the sewer lateral.

2.6 PIPE TO STRUCTURE CONNECTOR/SEAL

A. A flexible pipe to manhole connector shall be used for all pipe penetrations to pre-cast and/or cast-in-place concrete structures.
   1. The seal shall provide a flexible, positive, watertight connection between pipe and concrete wastewater structures. The connector shall assure that a seal is made between (1) the connector and the structure wall, and (2) between the connector and the pipe. The seal between the connector and the manhole wall shall be made by casting the connector integrally with the structure wall during the manufacturing process in such a manner that it will not pull out during coupling. The seal between connector and pipe will be made by way of a stainless steel take down band compressing the gasket against the outside diameter of the pipe.
   2. The connector shall be molded from materials whose physical/chemical properties meet or exceed the physical/chemical resistant properties outlined in ASTM C923. The connector and stainless steel hardware shall meet or exceed the performance requirements proscribed in ASTM C923.
   3. The connector shall be of size specifically designed for the pipe material being used and shall be installed in accordance with recommendations of the manufacturer.
   4. Connectors shall be Z-LOK or G3 connectors manufactured by A-LOK Products Inc. or approved equivalent.

PART 3 - EXECUTION

3.1 GRAVITY 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.

B. Pipe Depth and Trench Configuration: Conform to typical trench section(s) indicated.

C. Excavation, Bedding, Backfill, and Compaction: Section 312100, Utility Trenching and Backfill.

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 the manufacturer’s recommendations.

E. Laying:

1. All pipe and fittings shall be inspected by the County appointed Construction Manager before being placed in the trench.
2. 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.
3. Pipe trenches shall be kept free from water during pipe laying, joining or before sufficient backfill has been placed to prevent flotation of the pipe. The Contractor may use sump pumps or any other approved devices to remove water from the trench bottom. The Contractor shall provide ample means and devices to promptly remove and dispose of all water from any source entering the trench. The Contractor shall comply with all the National Pollutant Discharge Elimination System (NPDES) regulations.
4. No connection shall be made where joint surfaces and joint materials have been soiled by earth until such surfaces are thoroughly cleaned.
5. As the work progresses, the interior of all pipes shall be kept clean. After each line of pipe has been laid, it shall be carefully inspected and all earth, trash, rags, and other foreign matter removed from the interior.

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 at the end of each day's work or when work is not in progress.

3.2 INSTALLATION OF POLYVINYL CHLORIDE PIPING

A. Comply with the recommendations for pipe installation, joint assembly and appurtenance installation in AWWA M23.

B. Comply with the applicable requirements of AWWA C600 for joint assembly, and with the recommendations of Appendix A to AWWA C111.

C. Jointing:
1. Provide push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings.
2. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel.
3. For push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint.

4. Use an approved lubricant recommended by the pipe manufacturer for push-on joints.
5. Assemble push-on joints for connection to fittings, valves, and other accessories in accordance with the applicable requirements of AWWA C600 for joint assembly.
6. Make compression-type joints/mechanical-joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint. Cut off spigot end of pipe for compression-type joint or mechanical-joint connections and do not re-bevel.
7. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.

D. Pipe Anchorage:
1. Provide concrete thrust blocks or restrained joints for pipe anchorage, except where metal harness is indicated on the Plans.

3.3 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: Manufacturers' instructions

3.4 POURED-IN-PLACE CONCRETE

A. Concrete shall be mixed in accordance with applicable provisions of Section 033000, Cast-In-Place Concrete.

B. Construction of concrete structures shall conform to applicable provisions of Section 033000, Cast-In-Place Concrete. Unless otherwise noted herein or in the Plans, exposed surfaces of structures shall be Class 1 surface finish.

C. Curing shall conform to applicable portions in Section 033000, Cast-In-Place Concrete. No pigment shall be used in curing compounds. All work shall be subject to inspection. No concrete shall be placed until the Project Manager has approved the forms and reinforcement.

D. Concrete shall not be cropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than six feet. Spouts, elephant trunks, or other approved means shall be used to prevent segregation.

3.5 PIPE TO MANHOLE CONNECTION

A. Connection of PVC sewer pipe to existing sanitary sewer manholes shall be made by cutting an opening in the wall of the existing structure, inserting a length of PVC pipe into the opening and trimming flush with the interior the manhole wall, filling around the pipe with non-shrink grout, and troweling the inside and outside surfaces of the joint to a neat finish. Said opening shall not be greater than two inches (2") larger than the outside diameter of the pipe. Care shall be exercised in cutting these openings to prevent cracking or breaking of said sanitary sewer manhole. Pipe openings broken in a ragged and unworkmanlike manner, as determined by the County appointed Construction Manager, shall be rejected and either repaired or replaced, as

directed by the County appointed Construction Manager, all at the Contractor's sole expense, and no additional compensation will be allowed therefore.

B. All PVC pipe entering or leaving a manhole shall have a rubber sealing gasket, as supplied by the pipe manufacturer, firmly seated around the pipe exterior and perpendicular to the pipe axis. Said rubber sealing gasket shall be cast into the structure base or near the structure wall center as a water stop. Said water stop may also consist of a manhole coupling with rubber sealing rings cast into the structure base.

C. The bottom of the manhole shall be shaped to fit the invert of the sewer pipe.

D. New sanitary sewer manhole connections to pre-cast concrete bases can be made with elastomeric gasket seals such as ALOK or Press Seal PSX connections, or an approved equal. For poured in-place manholes the Contractor shall use manhole adapters or water stops.

3.6 INSTALLATION OF MANHOLE

A. Sanitary sewer manholes shall be installed in advance of open trench pipe installation work.

B. Manholes shall be constructed as shown on the Plans and as directed by the County appointed Construction Manager. Foundations for new manholes shall be poured against a base that is firm and dry. Precast manhole bases shall not be permitted.

C. New manholes shall be constructed over existing/new pipe where shown on the Plans. The foundations shall be poured such that the pipe is continuous through the manhole. The pipe shall be broken out and the manhole mortared to provide a smooth, uniform manhole wall.

D. The Contractor shall take measures to prevent the entry of extraneous material into the manholes and sewer pipes and shall be responsible for cleaning manholes and pipes of any such material.

3.7 INSTALLATION OF CLEANOUT

A. Cleanouts shall be constructed in such a manner that a 39-inch rigid cleaning rod can pass through the main line.

B. No cleanouts shall be installed without confirmation of its final location with the County appointed Construction manager.

3.8 GRAVITY PIPELINE AIR TESTING AND FLUSHING

A. All new sections of sanitary sewer shall be tested using the following procedures:
   1. Test is conducted between two consecutive manholes, or as directed by the Project Manager.
   2. The test section of the sewer shall be plugged at each end. One of the plugs used at the manhole shall be tapped and equipped for the air inlet connection for filling the line from an air compressor.
   3. All service laterals, stubs, and fittings into the sewer test section shall be properly capped or plugged and carefully braced against the internal pressure to prevent air leakage by slippage and blowout.

4. Connect air hose to tapped plug selected for the air inlet. Connect the other end of the air hose to the portable air control equipment, which consists of valves and pressure gauges used to control the air entry rate into the sewer test section, and to monitor the air pressure in the pipeline. More specifically, the air control equipment includes a shut-off valve, pressure regulating valve, pressure reduction valve, and a monitoring pressure gauge having a pressure range from 0-5 psi. The gauge shall have minimum divisions of 0.10 psi and an accuracy of 0.40 psi.
5. Connect another air hose between the air compressor (or other source of compressed air) and the air control equipment. This completes the test equipment set-up. Test operations may commence.
6. Supply air to the test section slowly, filling the pipeline until a constant pressure of 3.5 psig is maintained. The air pressure must be regulated to prevent the pressure inside the pipe from exceeding 5.0 psig.
7. When constant pressure of 3.5 psig is reached, throttle the air supply to maintain the internal pressure above 3.0 psig for at least 5 minutes. This time permits the temperature of the entering air to equalize with the temperature of the pipe wall. During this stabilization period, it is advisable to check all capped and plugged fittings with a soap solution to detect any leakage at these connections. If leakage is detected at any cap plug, release the pressure in the line and tighten all leaky caps and plugs. Start the test operation again by supplying air. When it is necessary to bleed off the air to tighten or repair a faulty plug, a new 5-minute interval must be allowed after the pipeline has been refilled.
8. After the stabilization period, adjust the air pressure to 3.5 psig and shut-off or disconnect the air supply. Observe the gauge until the air pressure reached 3.0 psig. At 3.0 psig, commence timing with a stopwatch until the pressure drops to 2.5 psig, at which time the stop watch is stopped. The time required, as shown on the stopwatch, for a pressure loss of 0.5 psig is used to compute the air loss.
9. If the time, in minutes and seconds, for the air pressure drop from 3.0 to 2.5 psi is greater than that shown in the following table for the designated pipe size, the section undergoing test shall have passed and shall be presumed to be free of defects. The test may be discontinued at any time.
10. If the time, in minutes and seconds, for the 0.5 psig drop is less than that shown in the following table for the designated pipe size, the section of the pipe shall not have passed the test; therefore, adequate repairs must be made and the line retested.

Requirements for Air Testing

Pipe Size (in inches)	Time Minutes	Seconds
4	2	32
6	3	50
8	5	6
10	6	22
12	7	39
14	8	56
15	9	35
16	10	12
18	11	34
20	12	30

11. For 8 inch and smaller pipe, only: if, during the 5-minute saturation period, pressure drops less than 0.5 psig after the initial pressurization and air is not added, the pipe section undergoing test shall have passed.

12. Multi-pipe sizes: when the sewer line undergoing test is 8 inch or larger diameter pipe and includes 4 inch or 6 inch laterals, the figures in the table for uniform sewer main sizes will not give reliable or accurate criteria for the test. Where multi-pipe sizes are to undergo the air test, the Project Manager can compute the "average" size in inches which is then multiplied by 38.2 seconds. The results will give the minimum time in seconds acceptable for a pressure drop of 0.5 psig for the "averaged" diameter pipe.
13. Adjustment Required for Groundwater:
    a. An air pressure correction is required when the ground water table is above the sewer line being tested. Under this condition, the air test pressure must be increased .433 psi for each foot the ground water level is above the invert of the pipe.
    b. Where ground water is encountered or is anticipated to be above the sewer pipe before the air testing will be conducted, the following procedure shall be implemented at the time the sewer main and manholes are constructed.
        1) Install a ½ inch diameter pipe nipple (threaded one or both ends, approximately 10 inch long) through the manhole wall directly on top of one of the sewer pipes entering the manhole with threaded end of nipple extending inside the manhole.
        2) Seal pipe nipple with a threaded ½ inch cap.
        3) Immediately before air testing, determine the ground water level by removing the threaded cap from the nipple, blowing air through the pipe nipple to remove any obstruction, and then connecting a clear plastic tube to the pipe nipple.
        4) Hold plastic tube vertically permitting water to rise in it to the groundwater level.
        5) After water level has stabilized in plastic tube, measure vertical height of water, in feet, above invert of sewer pipe.
        6) Determine air pressure correction, which must be added to the 3.0 psig normal starting pressure of test, by dividing the vertical height in feet by 2.31. The result gives the air pressure correction in pounds per square inch to be added.

B. After the line has passed the air test, it shall be balled and flushed with water to clean. A metal screen shall be used downstream at the point of connection to the existing system to collect and remove any rock or other debris that is flushed out during cleaning.

3.9 TESTING OF MANHOLES ON GRAVITY LINES

A. At the option of the Contractor, either the following hydrostatic or vacuum test shall be performed.
    1. Hydrostatic Test: In general, the following hydrostatic test is in conformance with that presented in the County Standard Specifications.
    2. Insert inflatable plugs in all sewer inlets and outlets.
    3. Fill the manhole with water to a point six inches below the base of the manhole frame.
    4. Maintain the water at this point for one hour to allow time for absorption.
    5. Begin one-hour test period. Measure the amount of water added in one-hour period to maintain the water level at six inches below the base of the manhole frame. Do not allow water level to drop more than 25% of the manhole depth.
    6. Determine the allowable leakage by the following formula.

L = 0.0002 x D x H1/2

L = Allowable leakage, gallons per minute.
D = Depth of manhole from top to bottom, feet.
H = Head of water in feet as measured from the surface of the water in the manhole to the sewer line invert or to the prevailing ground water surface outside the manhole. The lesser height governs.

7. If the leakage exceeds the allowable, determine the cause, take remedial action and re-test the manhole. If the leakage is less than the allowable and leaks are observed, repair the leaks.

B. Vacuum Test:
1. General: Test in accordance with ASTM C1244.
2. Test prior to backfilling around the manhole.
3. Test Preparation: Plug all lift holes and pipes entering or exiting the manhole.
4. Place test head inside the top section of the manhole's cone section and inflate in accordance with the manufacturer's instructions.
5. Draw a vacuum of 10 inches of mercury and shut the pump off.
6. With the valve closed, the time for the vacuum to drop 9 inches shall be measured.
7. The manhole shall pass the test if the time is greater than 60 seconds for a 48 inch diameter manhole, 75 seconds for a 60 inch diameter manhole and 90 seconds for a 72 inch diameter manhole.
8. If the manhole fails the initial test, make necessary repairs with a non-shrink grout. Once the repair material has cured according to the manufacturer's recommendations the vacuum test shall be repeated. This process shall continue until a satisfactory test is obtained.
9. All temporary plugs and braces shall be removed after each test.

3.10 DEFLECTION TESTING

A. Upon completion of work, perform a deflection test on entire length of installed plastic pipeline. Completed work includes superimposed loads adjacent to and over the pipeline, such as compacted backfill and earthwork, and does not include paving, concrete curbs and gutters, sidewalks, walkways, and landscaping.

B. Under external loads, deflection of pipe in the installed pipeline shall not exceed 4.5 percent of the average inside diameter of pipe.

C. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection-measuring device.

D. Pull-Through Device:
1. Provide a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft.
   a. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section.
   b. Pull-through device may also be of a design approved by the Uni-Bell Plastic Pipe Association, provided that the device meets the applicable requirements specified in this paragraph, including those for diameter of the device.
2. Ball, cylinder, or circular sections shall conform to the following:

a. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
b. A homogeneous material throughout, with a density greater than 1.0 as related to water at 39.2 degrees F, and a surface Brinell hardness of not less than 150.
c. Center bored and through bolted with a ¼ inch minimum diameter steel shaft having a yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.
d. Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.

E. Pull-Through Device:
1. Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water.
2. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions as specified.

F. Deflection measuring Device:
1. Sensitive to 1.0 percent of the diameter of the pipe being tested and accurate to 1.0 percent of the indicated dimension.
2. Obtain approval of deflection measuring device prior to use.

G. Deflection Measuring Device Procedure:
1. Measure deflections through each run of installed pipe.
2. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction.
3. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, remove pipe which has excessive deflections, replace with new pipe, and completely retest in same manner and under same conditions.

H. Warranty Period Test: Pipe found to have a deflection of greater than 5 percent of average inside diameter when deflection test is performed just prior to end of 1 year warranty period shall be replaced with new pipe and tested as specified for leakage and deflection.

3.11 CLEANING

A. The Contractor shall not allow the site to become littered with trash and waste material, but shall maintain the site in a neat and orderly condition throughout the construction period. On or before the acceptance of the work, the Contractor shall carefully clean out all pits, chambers or conduits; tear down and remove all temporary structures; remove rubbish of any kind from site; and leave the site in an acceptable condition, all to the satisfaction of the County appointed Construction Manager.

B. Thoroughly clean sewer lines and manholes of sediments, dirt, debris, and obstructions of any kind.

C. Excess dirt or soil material and waste materials, including rubbish of any kind, shall become the property of the Contractor and shall be disposed of outside of the public right-of-way.

3.12 TELEVISION INSPECTION

A. After completion of the pipe installation, service connections, flushing and cleaning, and prior to placement of pavement, the sewer 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 Owner and County appointed Construction Manager for review and acceptance.

B. Submitted DVDs shall include a continuous on-screen display, which contains, as a minimum, the date of the filming, identification of the line and segment (reach) of the line being viewed, and readout, in feet, showing the distance to the entry point. Video equipment shall include a television camera in color format specifically designed and constructed for operation in connection with sewer inspection and for operation in sewers under 100% humidity conditions. Lighting and camera quality shall produce a clear, in-focus picture of the entire periphery of the pipe for a minimum distance of six (6) feet. The camera shall be moved through the line, preferably in the direction of the sewage flow, at a moderate rate, stopping at joints, lateral connections and when necessary to permit proper documentation of the sewer's condition. In no case shall the television camera be operated at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line.

C. If, in the opinion of the County appointed Construction Manager, the submitted DVDs are of poor quality, the County appointed Construction Manager may reject the DVDs and require the TV inspection to be repeated and new DVDs submitted to the County appointed Construction Manager for review and acceptance. All DVDs shall become the property of the County.

D. Sags in the pipe will not be permitted. Any segment of pipe with sag shall be repaired in accordance with the Plans, these Special Provisions and as directed by the County appointed Construction Manager

E. 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

F. After completion of repairs, if any, the Contractor shall re-inspect the line by television inspection to the satisfaction of the County appointed Construction Manager. Any repair work, re-testing and/or re-inspection required shall be at the Contractor’s sole expense, and no additional compensation will be allowed therefore.

END OF SECTION – 333000

SECTION 334600

STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Work Included: Provide landscape drainage, complete, as shown and as specified.

B. Section Includes:

1. Parking Lot Drainage Systems including pipe, cleanouts, catch basins, inlets, junction structures, and area drains.
2. Flexible HDPE perforated Pipe
3. Perforated PVC Subdrain Pipe
4. Field Underdrain
5. Solid PVC Pipe
6. Drain Grates
7. Slot Drains
8. Drain Rock
9. Pea Gravel Drainage Course
10. Sand Drainage Course
11. Filter Fabric

C. Related Sections include:

1. Section 312000 “Earthwork”
2. Section 312100 “Utility Trenching and Backfill”
3. Section 321813 “Synthetic Turf”
4. Section 329113 “Soil Preparation”
5. Section 329119 “Landscape Finish Grading”
6. Section 329300 “Plants”

1.3 1.3 REFERENCES

A. Standard Specifications - Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS, latest edition.

B. ASTM - American Society for Testing and Materials

1. D1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
2. D2321: Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications
3. D2564: Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
4. D3034: Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
5. D4101: Propylene Injection and Extrusion Materials
6. F477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe
7. F656: Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings
8. F679: Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
9. F1336: Poly(Vinyl Chloride) (PVC) Gasket Sewer Fittings

1.4 DEFINITIONS

A. HDPE: High-density polyethylene

B. NPS: Nominal pipe size

C. PE: Polyethylene

D. PVC: Polyvinyl Chloride

1.5 SUBMITTALS

A. Manufacturers' Current Product Data: For each type of product indicated.

B. Samples:

1. Drain Grates: One (1) for each type and finish indicated.
2. Filter Fabric: Six (6) in. x six (6) in.

C. Shop Drawings: Submit slot drain shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures.

1.6 PROJECT/SITE CONDITIONS

A. Protection of Utilities:

1. Provide temporary support and protection of underground and surface utility structures, drains, services and other improvements to remain.
2. Where grade or alignment of pipe is obstructed by existing utility structures such as conduits, ducts or pipes, permanently support, relocate, remove or reconstruct the obstruction.
3. Restore all damaged improvements to original condition at no additional cost to Owner.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: All containerized products shall be delivered to the site in manufacturer's original, unopened, legibly labeled containers. All pipe to be delivered bound securely to prevent damage. Supply pallets as required to protect products.

B. Storage: Protect materials from damage, water and rust. Store pipes on beds, which are full length of pipe. (Protect plastic materials from direct sunlight.)

C. Pipe: Cap openings to prevent entry of dust, debris and other foreign matter.

1.8 SEQUENCING AND SCHEDULING

A. Concealed Work: Verify locations of existing stubouts to receive landscape area drains. Verify and locate existing pipes and structures to be coordinated with landscape drainage work. Review all available records and make all necessary explorations and excavations.

B. Lines and Levels: Establish for each drainage system and coordinate with other systems to prevent conflicts and maintain proper clearances.

C. Notification: Submit written notification of all discrepancies in the Drawings or existing

D. conditions, which preclude successful installation of landscape drainage work as specified.

PART 2 - PRODUCTS

2.1 PARKING AREA PIPE 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 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.
2. Brooks Products Inc.

3. OldCastle Precast/Christy Concrete Products, Inc.

2.2 PARKING AREA 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. Precast Structure: Rate for AASHTO H20 loading in traffic areas.

C. C. Frames, Grates and Covers: Provided by the same manufacturer as the catch basin

1. Steel frames, grates and covers
2. Grates and covers shall be non-rocking
3. Rate for AASHTO H20 loading in traffic areas

2.3 JOINT SEALANT FOR PRECAST STRUCTURES

A. Mortar:
1. Must be composed of cement, sand, and water. The proportion of sand to cement measured by volume must be 2 to 1. Mortar must contain only enough water to allow placing and packing. Sand particles must be no larger than ½ the size of the recess or space in which the mortar is to be placed.
2. 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 C443
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 Henry Company, or approved equal

2.4 PRECAST PIPE TO STRUCTURE CONNECTOR/SEAL

A. flexible pipe to manhole connector shall be used for all pipe penetrations to pre-cast concrete structures.

1. The seal shall provide a flexible, positive, watertight connection between pipe and concrete wastewater structures. The connector shall assure that a seal is made between (1) the connector and the structure wall, and (2) between the connector and the pipe. The seal between the connector and the manhole wall shall be made by casting the connector integrally with the structure wall during the manufacturing process in such a manner that it will not pull out during coupling. The seal between connector and pipe will be made by way of a stainless steel take down band compressing the gasket against the outside diameter of the pipe.
2. The connector shall be molded from materials whose physical/chemical properties meet or exceed the physical/chemical resistant properties outlined in ASTM C923. The

connector and stainless steel hardware shall meet or exceed the performance requirements proscribed in ASTM C923.

3. The connector shall be of size specifically designed for the pipe material being used and shall be installed in accordance with recommendations of the manufacturer.
4. Connectors shall be Z-LOK or G3 connectors manufactured by A-LOK Products Inc. or approved equivalent.

2.5 LANDSCAPE DRAINAGE PIPE AND FITTINGS

A. Manufacturers:

1. Advanced Drainage Systems, Inc., (800) 742-1933.
2. Approved equivalent.

B. Perforated Pipe: ASTM D1785, PVC 1120-1220, Schedule 40, pipes and fittings. Perforations: 3/8 in. diameter, 4 in. apart center to center longitudinally, in two rows 120 degrees apart.

C. Perforated Pipe Fittings: PVC, ASTM D 3034 manufactured by solid pipe manufacturer.

D. Perforated and Non-Perforated Polyethylene Tubing(for use in areas where flexible piping is required): Single wall corrugated pipe ASTM F 405 ASTM F 606

E. Solid Pipe: PVC with rubber ring joints, SDR 35; ASTM D 3034 for 4-15 inches diameter pipe; ASTM F 679 for 18-27 inches diameter pipe.

F. Solid Pipe Fittings: PVC, ASTM D 3034.

G. Storm Drain Pipe and fittings: ASTM D3034, SDR 35, Schedule 40

H. Field Underdrain: Hydraway 12-inch drain or approved equivalent.

2.6 DRAIN GRATES

A. Clean-out Grate, Round Structural Foam Polyolefin Grate with UV inhibitor

1. Model Number NDS#11, Color: Black, ADA compliant/heel-proof.
2. Manufacturer: NDS, www.ndepro.com 1(800) 726-1994. or approved equivalent.

B. 6 – Inch Area Drain in Paving:

1. Model Number NDS#40, Color: Black, ADA compliant/heel-proof.
2. Manufacturer: NDS, www.ndepro.com 1(800) 726-1994. or approved equivalent.

C. 6 - inch Area Drain in Planting Area: Round Structural Foam Polyolefin Grate with UV inhibitor

1. Model Number NDS#40, Color: Black
2. Manufacturer: NDS, www.ndepro.com 1(800) 726-1994. or approved equivalent.

2.7 ACCESSORIES

A. Drain Rock

1. Description: Clean, crushed stone free from injurious materials or soil and all deleterious chemicals. CDT Class II permeable material in accordance with Standard Specification 68-2.02F(3) “Class 2 permeable material”.
2. Physical Properties:
   a. Percentage Passing / Sieve Size: 100 / 1 in., 80 / 3/4 in., 20 / 1/2 in., 10 / 3/8 in., 5 / #4

B. Pea Gravel

1. 3/8 inch clean, natural pea gravel
2. Physical Properties:
   a. Percentage Passing / Sieve Size: 100 / 1/2 in., 85-100 / 3/8 in., 10-30 / #4, 0-10 / #8, 0-2 / #200

C. Sand Backfill: Fine granular material naturally produced by the disintegration of rock, free of organic material, mica, loam, clay and other deleterious substances to be thoroughly suitable for pipe bedding.

D. Filter Fabric: "Mirafi 140N or 140NC" by Mirafi, Inc., (800) 222-6036, "Supac 4NP" by Phillips Fibers Corporation and distributed by Pacific Corrugated Pipe, (415) 489-4744, or approved equal. Use only one brand for entire project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify exact locations and quantity of all drains relative to planting areas and adjacent to paving, prior to beginning of work. Identify required lines, levels, contours, and datum. Immediately report to Landscape Architect all discrepancies found prior to installation of drains.

B. Deviations: Make no deviations from specified line or grade without written acceptance of change by Landscape Architect.

3.2 INSTALLATION OF CURB INLETS, CATCH BASINS, DROP INLETS, JUNCTION STRUCTURES, AREA DRAINS, ETC. AND MANHOLES

A. Excavation, Bedding, Backfill, and Compaction: Section 31 21 00, Utility Trenching and Backfill

B. 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.

3.3 LANDSCAPE DRAINAGE INSTALLATION

A. Trenching and Backfilling: As specified in Section 312100 “Utility Trenching and Backfill”

B. Area Drains:

1. Install to locations and rim elevations as shown and detailed on the Drawings.
2. Connect to pipe stubouts in strict accordance with the manufacturer's current printed specifications.

C. Subsurface Drainage System:

1. Preparation of Trench: Accurately excavate trench as shown on the Drawings.
2. Filter Fabric: Place fabric in bottom of trench and extend up sides and beyond trench. Overlap 12 in. at ends of roll.
3. Drain Rock and Pipe: Install bedding portion of drain rock and bed pipe in place. Do not damage or displace filter fabric.
4. Review: Prior to installing remaining drain rock backfill, request review by Landscape Architect for progress of the work.
5. Closing: Upon acceptance, add remaining drain rock and lap over the ends of the filter fabric as shown on the Drawings.
6. oil Backfill: Backfill with permeable planting soil mix to a minimum depth of 6 in. above filter fabric as shown on Drawings.

3.4 FIELD QUALITY CONTROL

A. Tests: Field density test for compaction.

3.5 PROTECTION

A. General: Keep clean and protect sub-drainage system until commencement of work under Section 329113 “Soil Preparation”.

B. Subdrain: Monitor sub-drainage systems and immediately identify all problems with drainage. Make adjustments as necessary to maintain proper sub-drainage.

3.6 CLEANING

A. A.Thoroughly clean storm drain lines, manholes, catch basins, field inlets, culverts, and similar structures, of dirt, debris, and obstructions of any kind.

END OF SECTION 334600

Tree Inventory Summary Report

Flood Park, San Mateo County, California

October 2021

Prepared for:
San Mateo County
Department of Parks
455 County Center
Redwood City, CA

Prepared by:
Davey Resource Group, Inc.
295 South Water Street, Suite 300
Kent, Ohio 44240
800-828-8312

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Tree Inventory Executive Summary

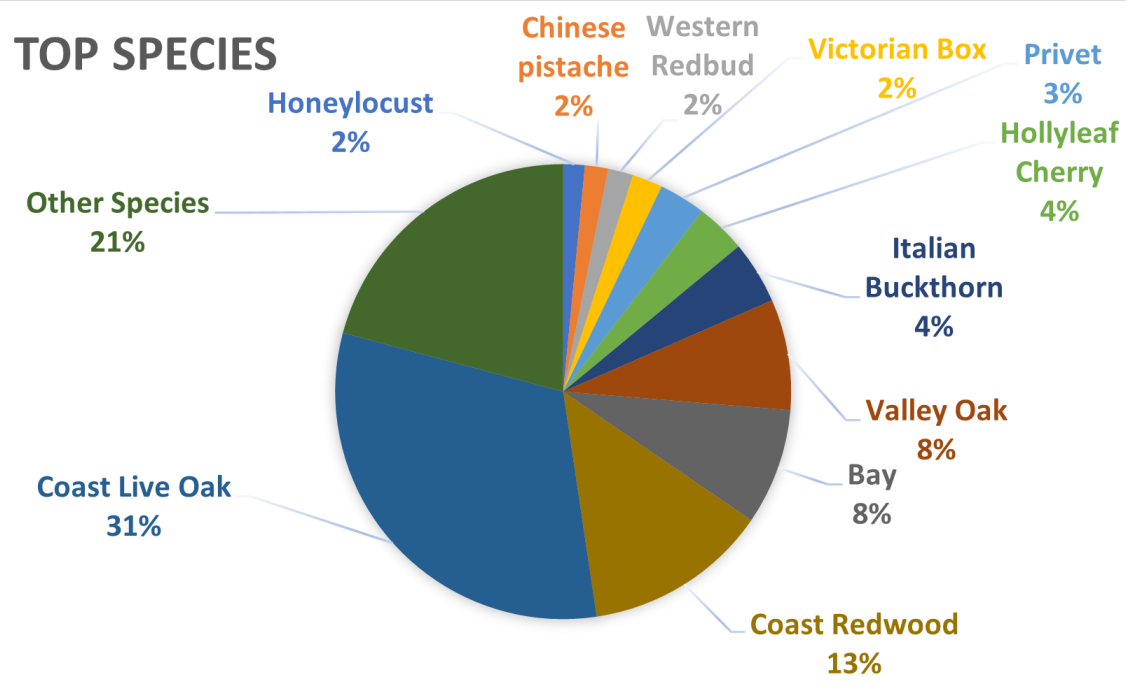
In October of 2021, the County of San Mateo, CA Parks Department contracted with Davey Resource Group, Inc. (DRG) to conduct an inventory of trees, provide maintenance recommendations, and develop a tree protection plan for trees at Flood Park. The results of this assessment are documented in the following inventory summary. The goal of this report is to provide an overview of the inventory, summarize recommendations, and highlight key observations.

A tree inventory is an invaluable tool for managers of public trees. Inventories should be kept current and accessed regularly to develop work assignments and plan strategies to mitigate potential hazards. These trees were inspected for risks to buildings, infrastructure, and public safety. The data set was collected as GIS-based tree inventory and will allow the County of San Mateo Parks Department to better understand, prioritize, and make decisions about the tree population. Analysis of the inventory data showed the following:

- 787 trees were inventoried.
- 53 distinct species were identified.
- The most common species is coast live oak (*Quercus agrifolia*) with 248 trees collected. Followed by coast redwood (*Sequoia sempervirens,* 103 trees), bay laurel (*Umbellularia californica*, 65 trees), valley oak (*Quercus lobata*, 62 trees), Italian buckthorn (*Rhamnus alaternus*, 35 trees), and hollyleaf cherry (*Prunus ilicifolia*, 28 trees).
- 9 trees are dead and should be removed: 6 dead trees have a DBH ranging from 6 to 17 inches and 3 dead trees have a DBH of <6 inches.
- 15 trees are in critical condition and removal should be considered: 10 trees have a DBH ranging from 6 to 22 inches and 5 trees have a DBH of <6 inches.
- 146 trees are in poor condition, while 617 trees (78%) are in fair or better condition.

Species Composition

- The majority of the tree population (60%) is represented by 4 native species: coast live oak (*Quercus agrifolia*), valley oak (*Q. lobata*), coast redwood (*Sequoia sempervirens*), and bay laurel (*Umbellularia californica*).



- The remaining 40% of the population is comprised of 49 species.

Botanical Name	Common Name	Tree Count	Frequency (%)
Quercus agrifolia	Coast live oak	248	31.8
Sequoia sempervirens	Coast redwood	103	13.2
Umbellularia californica	Bay laurel	65	8.3
Quercus lobata	Valley oak	62	7.9
Rhamnus alaternus	Italian buckthorn	35	4.5
Prunus ilicifolia	Hollyleaf cherry	28	3.6
Ligustrum ovalifolium	Privet	26	3.3
Pittosporum undulatum	Victorian box	17	2.2

Botanical Name	Common Name	Tree Count	Frequency (%)
Cercis occidentalis	Western redbud	14	1.8
Pistacia chinensis	Chinese pistache	13	1.7
Aesculus californica	California buckeye	12	1.5
Arbutus 'Marina'	'Marina' strawberry tree	12	1.5
Gleditsia triacanthos	Honeylocust	12	1.5
Pinus radiata	Monterey pine	11	1.4
Quercus ilex	Holly oak	10	1.3
Prunus spp	Plum	9	1.2
Arbutus unedo	Strawberry tree	8	1.0
Juglans regia	English walnut	7	0.9
Photinia glabra	Chinese photinia	7	0.9
Laurus nobilis	Sweet bay	6	0.8
Acer platanoides	Norway maple	5	0.6
Acacia melanoxylon	Black acacia	4	0.5
Arctostaphylos manzanita	Common manzanita	4	0.5
Koelreuteria bipinnata	Goldenrain tree	4	0.5
Magnolia grandiflora	Southern magnolia	4	0.5
Prunus cerasifera	Cherry plum	4	0.5
Quercus douglasii	Blue oak	4	0.5
Albizia julibrissin	Mimosa	3	0.4
Ginkgo biloba	Ginkgo	3	0.4
Juglans nigra	Black walnut	3	0.4
Liquidambar styraciflua	Sweetgum	3	0.4
Maytenus boaria	Mayten tree	3	0.4
Platanus x hispanica	London plane tree	3	0.4
Acer macrophyllum	Bigleaf maple	2	0.3
Calocedrus decurrens	Incense cedar	2	0.3
Fraxinus ornus	Flowering ash	2	0.3

Botanical Name	Common Name	Tree Count	Frequency (%)
Malus ioensis	Crabapple	2	0.3
Melaleuca styphelioides	Prickly melaleuca	2	0.3
Quercus rubra	Red oak	2	0.3
Schinus molle	Pepper tree	2	0.3
Triadica sebifera	Chinese tallow tree	2	0.3
Acer buergerianum	Trident maple	1	0.1
Acer saccharum	Sugar maple	1	0.1
Araucaria bidwillii	False monkey puzzle tree	1	0.1
Juniperus californica	California juniper	1	0.1
Lagerstroemia indica	Crape myrtle	1	0.1
Malus pumila	Apple	1	0.1
Pittosporum tobira	Japanese pittosporum	1	0.1
Prunus domestica	Plum	1	0.1
Pseudotsuga menziesii	Douglas-fir	1	0.1
Pyracantha coccinea	Scarlet firethorn	1	0.1
Sambucus nigra ssp. canadensis	Blue elderberry	1	0.1
Taxodium distichum	Bald cypress	1	0.1

Condition Breakdown

Tree condition affects value, benefits, and budget. Trees were evaluated for health, structure, and form using categories from a rating system established by the International Society of Arboriculture and defined in Table 4.1 in the Council of Tree and Landscape Appraisers Guide for Plant Appraisal 10th Edition. Tools used in data collection include standard diameter tape for trunk measurement and rangefinder for tree height and canopy radius measurements.

Table 4.1 Assessment of plant condition considers health, structure, and form. Each may be described in rating categories that can be translated into a percent rating.

Rating category	Condition components			Percent rating
	Health	Structure	Form	
Excellent	High vigor and nearly perfect health with little or no twig dieback, discoloration, or defoliation.	Nearly ideal and free of defects.	Nearly ideal for the species. Generally symmetric. Consistent with the intended use.	81% to 100%
Good	Vigor is normal for the species. No significant damage due to diseases or pests. Any twig dieback, defoliation, or discoloration is minor.	Well-developed structure. Defects are minor and can be corrected.	Minor asymmetries/deviations from species norm. Mostly consistent with the intended use. Function and aesthetics are not compromised.	61% to 80%
Fair	Reduced vigor. Damage due to insects or diseases may be significant and associated with defoliation but is not likely to be fatal. Twig dieback, defoliation, discoloration, and/or dead branches may comprise up to 50% of the crown.	A single defect of a significant nature or multiple moderate defects. Defects are not practical to correct or would require multiple treatments over several years.	Major asymmetries/deviations from species norm and/or intended use. Function and/or aesthetics are compromised.	41% to 60%
Poor	Unhealthy and declining in appearance. Poor vigor. Low foliage density and poor foliage color are present. Potentially fatal pest infestation. Extensive twig and/or branch dieback.	A single serious defect or multiple significant defects. Recent change in tree orientation. Observed structural problems cannot be corrected. Failure may occur at any time.	Largely asymmetric/abnormal. Detracts from intended use and/or aesthetics to a significant degree.	21% to 40%
Very poor	Poor vigor. Appears to be dying and in the last stages of life. Little live foliage.	Single or multiple severe defects. Failure is probable or imminent.	Visually unappealing. Provides little or no function in the landscape.	6% to 20%
Dead				0% to 5%

*From *Guide for Plant Appraisal, 10th Edition, Revised*, Council of Plant and Landscape Appraisers, International Society of Arboriculture, Atlanta, GA, 2019.

- The overall condition of each tree was assigned using the lowest assessed rating (Health, Structure, or Form). The overall condition of the tree population was:

Condition	Count	Frequency (%)
Excellent (81-100%)	0	0
Good (61-80%)	248	31.5
Fair (41-60%)	369	46.9
Poor (21-40%)	146	18.6
Critical (6-20%)	15	1.9
Dead (0-5%)	9	1.1

  - Over 78% of the tree population is in fair or better condition.

- 9 trees are dead and should be removed:

Tree #	Species	DBH (in)	Height
1708	Unknown	6	20
1792	*Rhamnus alaternus*	4	20
1793	*Rhamnus alaternus*	4	20
1992	Unknown	9	35
2279	Unknown	4	10
2415	Unknown	12, 12	20
2417	Unknown	12	18
2464	Unknown	17	20
2477	Unknown	7, 8	8

- 15 trees are in critical condition and removal should be considered:

Tree #	Species	DBH (in)	Height
1589	*Prunus* sp (plum)	4, 4, 5	20
1702	*Prunus* sp (plum)	5, 4, 4	18
1709	*Rhamnus alaternus*	4, 4	20
1726	*Prunus* sp (plum)	4, 2, 2, 2	16
1788	*Pinus radiata*	16	16
1911	*Arbutus unedo*	8	12
1960	*Sequoia sempervirens*	12, 7	35
1990	*Pittosporum undulatum*	9	30
1991	*Pittosporum undulatum*	15	30
2008	*Pittosporum undulatum*	7, 9	30
2104	*Sequoia semperviren*	8, 8	35
2171	*Ligustrum ovalifolium*	16	35
2173	*Ligustrum ovalifolium*	22	35
2238	*Rhamnus alaternus*	1	6
2418	*Sequoia sempervirens*	12	20

Tree Size and Classification

Diameter Breakdown of Tree Population

Trunk DBH class size ranged from 1 inch up to 70 with an average DBH of 12.9 inches. Over one half of the Flood Park tree inventory is less than 13-inch DBH, indicating the majority of trees inventoried are young to semi-mature.

Size class breakdown:

- 1-2 inch DBH: 28 trees (3.6%)
- 3-6 inch DBH: 214 trees (27.2%)
- 7-12 inch DBH: 182 trees (23.1%)
- 13-20 inch DBH: 151 trees (19.2%)
- 21-29 inch DBH: 102 trees (12.9%)
- 30-36 inch DBH: 65 trees (8.3%)
- Over 36 inch DBH: 46 trees (5.8%)

Tree Classification

Trees were classified as Significant, Heritage, or N/A using the San Mateo County Ordinance Sections 11,000 and 12,000.

- 394 trees were considered Significant trees (50.1%)
- 387 trees were considered N/A (49.2%)
- 6 trees were considered Heritage trees (0.8%)

Maintenance Prioritization

Tree maintenance was prescribed based on the health and structure of each tree, and a prioritization rating was assigned on a scale of 1 to 5 to address the urgency of prescribed work and the potential benefit of the maintenance based on tree location and value. The likelihood of tree failure based on obvious defects combined with the occupancy rate within the immediate area around the tree was taken into account when assigning priority. Prioritizing work provides the county with a wide range of options for establishing a maintenance schedule, budget planning and negotiation.

Prioritization Rating	Count	Frequency (%)
• 1 - Immediate Action/High Value	59	7.5
• 2 - Near Term (1-3 years)/Fair Value	127	16.1
• 3 - Mid Term (3-5 years)/Moderate Value	305	38.8
• 4 - Long Term (5-10 years)/Poor Value	144	18.3
• 5 - No management recommended at time of inspection/No Value	152	19.3

Maintenance Recommendations

A maintenance task was recommended for each tree.

- Crown cleaning was prescribed for 503 trees (63.9%)
- No maintenance was recommended for 152 trees (19.3%)
- Remove was recommended for 85 trees (10.8%)
- End weight reduction was recommended for 29 trees (3.7%)
- Structural pruning for young trees was recommended for 12 trees (1.5%)
- Structural restoration pruning was recommended for 3 trees (0.4%)
- Tree risk assessment was recommended for 2 trees (0.3%)
- Remove stakes/hardware was recommended for 1 tree (0.1%)

Maintenance Task and Priority Ratings

Priority 1 Ratings-Immediate Action/High Value

- Clean 52 trees
- Remove 7 trees

Priority 2 Ratings-Near Term (1-3 years)/Fair Value

- Clean 97 trees
- Remove 13 trees
- Reduce end weight 8 trees
- Structural prune 5 trees
- Tree risk assessment 2 trees
- Structural restoration 1 tree
- Remove stakes/hardware 1 tree

Priority 3 Ratings-Mid Term (3-5 years)/Moderate Value

- Clean 265 trees
- Remove 16 trees
- Reduce end weight 18 trees
- Structural prune (young tree) 6 trees

Priority 4 Ratings-Long Term (5-10 years)/Poor Value

- Clean 89 trees
- Remove 49 trees
- Reduce end weight 3 trees
- Structural restoration 2 trees
- Structural prune 1 tree

Priority 5 Ratings-No management recommended at time of inspection/No Value

- None (no maintenance recommended) 152 trees

Tree Removals

- Eighty-five trees were listed for removal:

Tree #					
13	92	161	268	491	586
16	95	164	270	495	597
22	104	178	282	500	644
29	110	182	291	501	671
32	113	194	300	510	692
42	115	197	310	516	708
51	121	208	313	521	741
57	123	209	314	533	750
58	124	214	328	538	753
61	127	239	346	542	755
74	133	246	365	555	759
81	143	254	370	563	770
82	150	261	471	571	773
84	153	264	482	579	778
					792

Trees Identified for a Tree Risk Assessment

- Two trees were identified as having potential for a tree risk assessment:
  - Tree 166 is in poor condition with large deadwood
  - Tree 170 is in fair condition with decay in the trunk and roots, and has excessive lean

Project Limitations

Many factors can limit specific and accurate data when performing evaluations of trees, their conditions, and potential for failure or response to site disturbances. No soil or tissue testing was performed. All observations were made from the ground on September 23-29, 2021, and no soil excavation to expose roots was performed. The determinations and recommendations presented here are based on current data and conditions that existed at the time of the evaluation and cannot be a predictor of the ultimate outcome for the evaluated trees in the future. No physical inspection of the upper canopy, sounding, root crown excavation, resistance drilling or other technologies were used in the evaluation of the trees.

A tree inventory is an invaluable tool for property managers. It should be kept current and accessed regularly to develop work assignments and plan strategies to mitigate potential hazards. These trees were inspected for health and condition concerns, with an interest in safety mitigations, in addition to long term sustainability. The trees should be assessed on an annual or bi-annual cycle by an ISA certified arborist.

CORNERSTONE EARTH GROUP

Type of Services	**Geotechnical Investigation**
Project Name	**Reimagine Flood Park**
Location	**215 Bay Road** **Menlo Park, California**
Client	**CMG Landscape Architecture**
Client Address	**444 Bryant Street** **San Francisco, California**
Project Number	**1326-1-1**
Date	**June 27, 2022**

Prepared by

Jennifer L. Campbell, P.E.
Project Engineer

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CORNERSTONE EARTH GROUP

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Type of Services	**Geotechnical Investigation**
Project Name	**Reimagine Flood Park**
Location	**215 Bay Road** **Menlo Park, California**

SECTION 1: INTRODUCTION

This geotechnical report was prepared for the sole use of CMG Landscape Architecture for the Reimagine Flood Park project in Menlo Park, California. The location of the site is shown on the Vicinity Map, Figure 1. For our use, we were provided with the following documents:

- A landscape plan titled, "Reimagine Flood Park, County of San Mateo," prepared by Gates and Associates, dated 2020.
- A utility plan titled, "Potential IWFS Test Well Locations," author unknown, dated October 28, 2021.

1.1 PROJECT DESCRIPTION

The project will include renovating and modernizing the existing Flood Park. Site work will include restoration of the existing adobe structures, addition of several restroom facilities, and construction of additional recreational facilities including new athletic fields, tennis and volleyball courts, fitness areas, playgrounds, picnic areas with shade structures, a pump track, and walking paths. Appurtenant parking, utilities and irrigation facilities are also planned.

Loading information for the structures are not known at this time, however, we assume structural loads will be typical for small structures and canopies. We anticipate cuts and fills on the order of less than 1 to 3 feet will be required for site grading.

1.2 SCOPE OF SERVICES

Our scope of services was presented in our proposal dated May 10, 2021 and consisted of field and laboratory programs to evaluate physical and engineering properties of the subsurface soils, engineering analysis to prepare recommendations for site work and grading, building foundations, drilled piers, flatwork, and pavements, and preparation of this report. Brief descriptions of our exploration and laboratory programs are presented below.

1.3 EXPLORATION PROGRAM

Field exploration consisted of 7 borings drilled on November 23 and 24, 2021 with track-mounted, hollow-stem auger drilling equipment. The borings were drilled to depths ranging from about 10 to 30 feet. The borings were backfilled with cement grout in accordance with local requirements; exploration permits were obtained as required by local jurisdictions.

The approximate locations of our exploratory borings are shown on the Site Plan, Figure 2. Details regarding our field program are included in Appendix A.

1.4 LABORATORY TESTING PROGRAM

In addition to visual classification of samples, the laboratory program focused on obtaining data for foundation design and seismic ground deformation estimates. Testing included moisture contents, dry densities, washed sieve analyses, Plasticity Index tests, and a Modified Proctor compaction test. Details regarding our laboratory program are included in Appendix B.

1.5 CORROSION EVALUATION

Four samples from our borings from depths from about 1½ to 5½ feet were tested for saturated resistivity, pH, and soluble sulfates and chlorides. JDH Corrosion Consultants prepared a brief corrosion evaluation based on the laboratory data, which is attached to this report in Appendix C. In general, the on-site soils can be characterized as moderately to very severely corrosive to buried metal, and non-corrosive to buried concrete.

1.6 ENVIRONMENTAL SERVICES

Cornerstone Earth Group also provided environmental services for this project, including a Phase 1 site assessment and preliminary soil testing for off haul evaluation. Environmental findings and conclusions are provided under separate covers.

SECTION 2: REGIONAL SETTING

2.1 GEOLOGICAL SETTING

The site is located within the San Francisco Peninsula, which is a narrow band of rock at the north end of the Santa Cruz Mountains separating the Pacific Ocean from San Francisco Bay. This represents one mountain range in a series of northwesterly–aligned mountains forming the Coast Ranges geomorphic province of California that stretches from the Oregon border to nearly Point Conception. In the San Francisco Bay area, most of the Coast Ranges have developed on a basement of tectonically mixed Cretaceous- and Jurassic-age (70- to 200-million years old) rocks of the Franciscan Complex. Locally, these basement rocks are capped by younger sedimentary and volcanic rocks.

The San Andreas Fault system, including the Monte Vista-Shannon Fault, exists within the Santa Cruz Mountains and the Hayward and Calaveras Fault systems exist within the Diablo Range across San Francisco Bay to the east.

2.2 REGIONAL SEISMICITY

While seismologists cannot predict earthquake events, geologists from the U.S. Geological Survey have recently updated (in 2015) earlier estimates from their 2014 Uniform California Earthquake Rupture Forecast (Version 3; UCERF3) publication. The estimated probability of one or more magnitude 6.7 earthquakes (the size of the destructive 1994 Northridge earthquake) expected to occur somewhere in the San Francisco Bay Area has been revised (increased) to 72 percent for the period 2014 to 2043 (Aagaard et al., 2016). The faults in the region with the highest estimated probability of generating damaging earthquakes between 2014 and 2043 are the Hayward (33%), Calaveras (26%), and San Andreas Faults (22%). In this 30-year period, the probability of an earthquake of magnitude 6.7 or larger occurring is 22 percent along the San Andreas Fault and 33 percent for the Hayward Fault.

The faults considered capable of generating significant earthquakes are generally associated with the well-defined areas of crustal movement, which trend northwesterly. Table 1 below presents the State-considered active faults within 25 kilometers of the site.

Table 1: Approximate Fault Distances

Fault Name	Distance	
	(miles)	(kilometers)
Monte Vista-Shannon	4.8	7.8
San Andreas (1906)	6.3	10.2
Hayward (Total Length)	12.6	20.2
Hayward (Southeast Extension)	14.9	24.0
San Gregorio	15.8	25.5

A regional fault map is presented as Figure 3, illustrating the relative distances of the site to significant fault zones.

SECTION 3: SITE CONDITIONS

3.1 SITE BACKGROUND AND SURFACE DESCRIPTION

The site is currently occupied by Flood County Park, a 21-acre park containing several adobe structures, athletic facilities, playgrounds, picnic areas, and open lawn areas. The site is bounded by commercial development and Highway 101 to the north/northeast and residential development to the east, south, and west.

We reviewed historic aerial photographs dating back to 1948 provided on www.historicaerials.com. We also reviewed the project Request for Proposal and the provided "Potential IWFS Test Well Locations" plan. We understand Flood County Park opened in the early 1930s. The development included construction of several adobe structures and recreational facilities including a swimming pool. The swimming pool was removed in the 1970's. We understand improvements were implemented in the 1980's to improve accessibility for people with disabilities. Several utilities are currently present within the site including a San Francisco Public Utilities Commission (SFPUC) Hetch Hetchy Aqueduct water line running east-west through the site.

Boring EB-1 was performed in the pavement adjacent to the existing baseball field and stadium seating. Surface pavements at EB-1 generally consisted of about 4 inches of asphalt concrete over subgrade. Based on visual observations, the existing pavements within the parking lot are in poor shape with significant alligator and block cracking. Existing flatwork within the park pathways were observed to be in fair shape.

3.2 SUBSURFACE CONDITIONS

Northern Borings

Borings EB-1 and EB-2, located within the northern portion of the site, generally encountered undocumented fills to depths of about 6 and 2½ feet, respectively. The undocumented fills consisted of very stiff to hard sandy lean clay and medium dense silty sand. Beneath the fills, the Borings generally encountered very stiff to hard lean clay with variable amounts of sand to a depths of about 10 and 20 feet, the terminal depths of Borings EB-1 and EB-2 respectively.

Southern and Central Borings

Fill was encountered within the central and southern portions of the site at Borings EB-3 and EB-5 to depths of about 3 and 1½ feet respectively. The undocumented fills consisted of very stiff to hard lean clay with variable amounts of sand and gravel and loose silty sand. Beneath the undocumented fills at Borings EB-3 and EB-5 and beneath the surface at Borings EB-4, EB-6, and EB-7, our southern and central explorations encountered very stiff to hard lean clay with variable amounts of sand to depths ranging from about 4 to 5½ feet below current site grades underlain by loose to medium dense clayey sand to depths ranging from about 5¼ to 8½ feet below grade. The clayey sand was underlain by very stiff to hard lean clay with variable amounts of sand and gravel to a depth of about 30 feet, the maximum depth explored.

3.2.1 Plasticity/Expansion Potential

We performed two Plasticity Index (PI) tests on representative samples of the near surface soils collected at depths of about 2 to 4 feet below current site grades. Test results were used to evaluate expansion potential of surficial soils. The results of the surficial PI tests indicated PIs ranging from 25 to 29, indicating moderate to high expansion potential to wetting and drying cycles.

3.2.2 In-Situ Moisture Contents

Laboratory testing indicated that the in-situ moisture contents within the upper 10 feet range from about 4 percent below to 10 percent above the estimated laboratory optimum moisture.

3.3 GROUNDWATER

Groundwater was encountered in Borings EB-2, EB-3, and EB-4 at depths ranging from 18 to 23½ feet below current grades. All measurements were taken at the time of drilling and may not represent the stabilized levels that can be higher than the initial levels encountered. Historic high groundwater is mapped by the California Geologic Survey at a depth of about 10 to 12 feet below the ground surface (CGS, Palo Alto 7.5-Minute Quadrangle).

We also reviewed groundwater data available online from the website GeoTracker, https://geotracker.waterboards.ca.gov/. Nearby monitoring well data at 4040 Campbell Avenue (approximately 0.6 miles northwest of the site) indicates that groundwater has been measured at depths of approximately 5½ to 7½ feet below grade between September 2005 and August 2012. Additionally, nearby monitoring well data at 795 Willow Road (approximately 0.9 miles southeast of the stie) indicates groundwater has been measured at depths of approximately 17½ to 20½ feet below grade between January 2002 and December 2003.

Based on the above, we recommend a design groundwater depth of 10 feet below the ground surface. Fluctuations in groundwater levels occur due to many factors including seasonal fluctuation, underground drainage patterns, regional fluctuations, and other factors.

3.4 IN-SITU WATER INFILTRATION

To estimate the infiltration rate of the soils at locations and depths provided by the Civil Engineer for the project, we performed two in-situ field infiltration tests using a Guelph permeameter by SoilMoisture Equipment Corp., Model #2800, in general accordance with ASTM D5126. Generally, the Guelph permeameter is a constant head device which uses two water-filled chambers to measure infiltration rate in a shallow borehole. A constant head level is established in the borehole and the rate of water outflow into the surrounding soil is noted. The rate of flow when it reaches a steady state, or constant rate, is used to determine an approximate infiltration rate for that location and depth.

The approximate location of the field infiltration tests (I-1 and I-2) are shown on the Site Plan, Figure 2. The infiltration tests were performed at approximate depths of about 3½ and 4½ feet below existing site grades. The test results are summarized in Table 2.

Table 2: In-Situ Field Guelph Permeameter Test Results

Location	Depth Below Existing Grade (ft)	Infiltration Rate (in/hr)
P-1	3.5	2.2
P-2	4.5	1.8

3.4.1 Reliability of Field Test Data

Test results may not be truly indicative of the long-term, in-situ infiltration. Other factors including stratifications, heterogeneous deposits, overburden stress, disturbance, organic content, depth to groundwater, and other factors can influence test results. In addition, for stratified soils such as those encountered at the site, the average horizontal infiltration is typically greater than the average vertical infiltration.

3.4.2 Findings and Recommendations

Based on our findings, the soil at the locations tested and at depths of about 3½ and 4½ feet below existing grade have infiltration rates ranging from about 1.8 to 2.2 inches per hour. Based on our test results, the in-situ field tests indicated generally a low infiltration rate at the depths and locations tested.

We recommend the above estimate be confirmed in the field at the time of construction, as required. In addition, the project civil engineer should review the above information and provide additional recommendations as deemed necessary.

3.4.3 General Comments and Design Considerations

As discussed, the tests were performed at discrete locations and depths. In addition, some disturbance in preparing the test also can occur. Therefore, the above results can vary significantly and may not be representative over the entire site. Our hand auger explorations at the locations tested generally encountered lean clay to depths of about 3 to 4 feet underlain by clayey sand with gravel. Localized areas/depths with higher or lower permeable materials can increase or decrease the actual infiltration rates. Therefore, we recommend the potential for variations be considered when evaluating the soil infiltration capacity or performance.

SECTION 4: GEOLOGIC HAZARDS

4.1 FAULT SURFACE RUPTURE

As discussed above several significant faults are located within 25 kilometers of the site. The site is not located within a State-designated Alquist Priolo Earthquake Fault Zone. As shown in Figure 3, no known surface expression of fault traces is thought to cross the site; therefore, fault surface rupture hazard is not a significant geologic hazard at the site.

4.2 ESTIMATED GROUND SHAKING

Moderate to severe (design-level) earthquakes can cause strong ground shaking, which is the case for most sites within the Bay Area. A peak ground acceleration (PGA) was estimated for analysis using a value equal to F_{PGA}*PGA, as allowed in the 2019 edition of the California Building Code when an exception has been taken per ASCE 7-16, Section 11.4.8. For our liquefaction analysis we used a PGA_M of 0.698g.

4.3 LIQUEFACTION POTENTIAL

The site is not located within a State-designated Liquefaction Hazard Zone (CGS, Palo Alto Quadrangle, 2006). However, we screened the site for liquefaction during our site exploration by retrieving samples from the site, performing visual classification on sampled materials, and performing various tests to further classify the soil properties.

During strong seismic shaking, cyclically induced stresses can cause increased pore pressures within the soil matrix that can result in liquefaction triggering, soil softening due to shear stress loss, potentially significant ground deformation due to settlement within sandy liquefiable layers as pore pressures dissipate, and/or flow failures in sloping ground or where open faces are present (lateral spreading) (NCEER 1998). Limited field and laboratory data is available regarding ground deformation due to settlement; however, in clean sand layers settlement on the order of 2 to 3 percent of the liquefied layer thickness can occur. Soils most susceptible to liquefaction are loose, non-cohesive soils that are saturated and are bedded with poor drainage, such as sand and silt layers bedded with a cohesive cap.

As discussed in the “Subsurface” section above, we primarily encountered very stiff cohesive soils beneath the design groundwater depth of 10 feet. Based on the above, our screening of the site for liquefaction indicates a low potential for liquefaction.

4.4 LATERAL SPREADING

Lateral spreading is horizontal/lateral ground movement of relatively flat-lying soil deposits towards a free face such as an excavation, channel, or open body of water; typically, lateral spreading is associated with liquefaction of one or more subsurface layers near the bottom of the exposed slope. As failure tends to propagate as block failures, it is difficult to analyze and estimate where the first tension crack will form.

As discussed, we primarily encountered very stiff cohesive soils beneath the design groundwater depth of 10 feet. We reviewed the historical ground failure map presented in the Seismic Hazard Zone Report for the vicinity (CGS, Palo Alto 7.5-Minute Quadrangle) which indicated two occurrences of lateral spread approximately 2½ to 3 miles south of the site. However, there are no open faces within a distance considered susceptible to lateral spreading. Therefore, in our opinion, the potential for lateral spreading to affect the site is low.

4.5 SEISMIC SETTLEMENT/UNSATURATED SAND SHAKING

Loose to medium dense unsaturated sandy soils can settle during strong seismic shaking. The soils encountered at the site above the design groundwater depth of 10 feet were predominantly very stiff to hard clays and medium dense to dense clayey and silty sands with 35 to 39 percent passing the Number 200 sieve. Therefore, in our opinion, the potential for significant differential seismic settlement affecting the proposed improvements is low.

4.6 TSUNAMI/SEICHE

The terms tsunami or seiche are described as ocean waves or similar waves usually created by undersea fault movement or by a coastal or submerged landslide. Tsunamis may be generated at great distance from shore (far field events) or nearby (near field events). Waves are formed, as the displaced water moves to regain equilibrium, and radiates across the open water, similar to ripples from a rock being thrown into a pond. When the waveform reaches the coastline, it quickly raises the water level, with water velocities as high as 15 to 20 knots. The water mass, as well as vessels, vehicles, or other objects in its path create tremendous forces as they impact coastal structures.

Tsunamis have affected the coastline along the Pacific Northwest during historic times. The Fort Point tide gauge in San Francisco recorded approximately 21 tsunamis between 1854 and 1964. The 1964 Alaska earthquake generated a recorded wave height of 7.4 feet and drowned eleven people in Crescent City, California. For the case of a far-field event, the Bay area would have hours of warning; for a near field event, there may be only a few minutes of warning, if any.

A tsunami or seiche originating in the Pacific Ocean would lose much of its energy passing through San Francisco Bay. Based on the mapping of tsunami inundation potential for the San Francisco Bay Area by CGS (conservation.ca.gov/cgs/tsunami/maps), areas most likely to be inundated are marshlands, tidal flats, and former bay margin lands that are now artificially filled, but are still at or below sea level, and are generally within 1½ miles of the shoreline. The site is approximately 2 miles inland from the San Francisco Bay shoreline and is approximately 19 to 25 feet above mean sea level (Google Earth, 2021). Therefore, the potential for inundation due to tsunami or seiche is considered low.

4.7 FLOODING

Based on our internet search of the Federal Emergency Management Agency (FEMA) flood map public database, the site is located within Zone X, described as an area of minimal flood hazard. We recommend the project civil engineer be retained to confirm this information and verify the base flood elevation, if appropriate.

The Department of Water Resources (DWR), Division of Safety of Dams (DSOD) compiled a database of Dam Failure Inundation Hazard Maps (DSOD, 2015). The generalized hazard maps were prepared by dam owners as required by the State Office of Emergency Services; they are intended for planning purposes only. Based on our review of these maps, the site is not located within a dam failure inundation area.

SECTION 5: CONCLUSIONS

5.1 SUMMARY

From a geotechnical viewpoint, the project is feasible provided the concerns listed below are addressed in the project design. Descriptions of each concern with brief outlines of our recommendations follow the listed concerns.

- Redevelopment considerations
- Shallow groundwater
- Presence of moderately to highly expansive soils
- Undocumented fill
- Soil Corrosion Potential

5.1.1 Redevelopment Considerations

As discussed, the site is currently occupied by several structures, site fixtures, and landscaping. We understand that some of the existing improvements will be demolished for the construction of the building additions. Potential issues that are often associated with redeveloping sites include demolition of existing improvements, abandonment of existing utilities, and undocumented fills. Please refer to the "Earthwork" section below for further recommendations.

5.1.2 Shallow Groundwater

Shallow groundwater was measured at depths ranging from approximately 17½ to 27 feet below the existing ground surface. However, based on our review of CGS maps and nearby well data we recommend a design groundwater depth of 10 feet. Our experience with similar sites in the vicinity indicates that shallow groundwater could significantly impact grading and underground construction. These impacts typically consist of potentially wet and unstable pavement subgrade, difficulty achieving compaction, and difficult underground utility installation. Dewatering and shoring of utility trenches may be required in some isolated areas of the site. Detailed recommendations addressing this concern are presented in the "Earthwork" section of this report.

5.1.3 Expansive Soils

Moderately to highly expansive surficial soils generally blanket the site. Expansive soils can undergo significant volume change with changes in moisture content. They shrink and harden when dried and expand and soften when wetted. To reduce the potential for damage to the planned structures, slabs-on-grade should have sufficient reinforcement and be supported on a layer of non-expansive fill; footings should extend below the zone of seasonal moisture fluctuation. In addition, it is important to limit moisture changes in the surficial soils by using positive drainage away from buildings as well as limiting landscaping watering. We recommend that a plug of low-permeability clay soil, sand-cement slurry, or lean concrete be placed within trenches just outside where the trenches pass into building and pavement areas. Detailed

grading and foundation recommendations addressing this concern are presented in the following sections.

5.1.4 Undocumented Fill

Fills were encountered to a depth of up to about 6 feet in our explorations. Additionally, we understand a swimming pool located south of the existing baseball field was previously demolished. Undocumented fill may be present as a result of prior development grading and demolition backfill; any fills encountered during site grading should be completely removed from within building areas and to a lateral distance of at least 5 feet beyond the building footprints or to a lateral distance equal to fill depth below the perimeter footing, whichever is greater. Provided the fills meet the "Material for Fill" requirements below, the fills may be reused when backfilling the excavations. Based on review of the samples collected from our borings, it appears that the fill may be reused. If materials are encountered that do not meet the requirements, such as debris, wood, trash, those materials should be screened out of the remaining material and be removed from the site. Backfill of excavations should be placed in lifts and compacted in accordance with the "Compaction" section below.

Provided undocumented fills are mitigated by removal and replacement as engineered fill, the potential impact due to undocumented fill should be low.

5.1.5 Soil Corrosion Potential

A preliminary soil corrosion screening was performed by JDH Corrosion Consultants based on the results of analytical tests on samples of the near-surface soil. In general, the JDH report concludes that the corrosion potential for buried concrete does not warrant the use of sulfate resistant concrete. In addition, the corrosion potential for buried metallic structures, such as metal pipes, is considered corrosive. JDH recommends that special requirements for corrosion control be made to protect metal pipes. A more detailed discussion of the site corrosion evaluation is presented in Appendix C. As the preliminary soil corrosion screening was based on the results of limited sampling, consideration may be given to collecting and testing additional samples from the upper 5 feet for sulfates and pH to confirm the classification of corrosive to mortar coated steel and concrete.

5.2 PLANS AND SPECIFICATIONS REVIEW

We recommend that we be retained to review the geotechnical aspects of the project structural, civil, and landscape plans and specifications, allowing sufficient time to provide the design team with any comments prior to issuing the plans for construction.

5.3 CONSTRUCTION OBSERVATION AND TESTING

As site conditions may vary significantly between the small-diameter borings performed during this investigation, we also recommend that a Cornerstone representative be present to provide geotechnical observation and testing during earthwork and foundation construction. This will allow us to form an opinion and prepare a letter at the end of construction regarding contractor

compliance with project plans and specifications, and with the recommendations in our report. We will also be allowed to evaluate any conditions differing from those encountered during our investigation and provide supplemental recommendations as necessary. For these reasons, the recommendations in this report are contingent of Cornerstone providing observation and testing during construction. Contractors should provide at least a 48-hour notice when scheduling our field personnel.

SECTION 6: EARTHWORK

6.1 SITE DEMOLITION

All existing improvements not to be reused for the current development, including all foundations, flatwork, pavements, utilities, and other improvements should be demolished and removed from the site. Recommendations in this section apply to the removal of these improvements, which are currently present on the site, prior to the start of mass grading or the construction of new improvements for the project.

Cornerstone should be notified prior to the start of demolition and should be present on at least a part-time basis during all backfill and mass grading as a result of demolition. Occasionally, other types of buried structures (wells, cisterns, debris pits, etc.) can be found on sites with prior development. If encountered, Cornerstone should be contacted to address these types of structures on a case-by-case basis.

6.1.1 Demolition of Existing Slabs, Foundations and Pavements

All slabs, foundations, and pavements should be completely removed from within planned building areas.

Special care should be taken during the demolition and removal of existing floor slabs, foundations, utilities and pavements to minimize disturbance of the subgrade. Excessive disturbance of the subgrade, which includes either native or previously placed engineered fill, resulting from demolition activities can have serious detrimental effects on planned foundation and paving elements.

Existing foundations are typically mat-slabs, shallow footings, or piers/piles. If slab or shallow footings are encountered, they should be completely removed. If drilled piers are encountered, they should be cut off at an elevation at least 60-inches below proposed footings or the final subgrade elevation, whichever is deeper. The remainder of the drilled pier could remain in place. Foundation elements to remain in place should be surveyed and superimposed on the proposed development plans to determine the potential for conflicts or detrimental impacts to the planned construction. Following review, additional mitigation or planned foundation elements may need to be modified.

6.1.2 Abandonment of Existing Utilities

All utilities should be completely removed from within planned building areas. For any utility line to be considered acceptable to remain within building areas, the utility line must be completely backfilled with grout or sand-cement slurry (sand slurry is not acceptable), the ends outside the building area capped with concrete, and the trench fills either removed and replaced as engineered fill with the trench side slopes flattened to at least 1:1, or the trench fills are determined not to be a risk to the structure. The assessment of the level of risk posed by the particular utility line will determine whether the utility may be abandoned in place or needs to be completely removed. The contractor should assume that all utilities will be removed from within building areas unless provided written confirmation from both the owner and the geotechnical engineer.

Utilities extending beyond the building area may be abandoned in place provided the ends are plugged with concrete, they do not conflict with planned improvements, and that the trench fills do not pose significant risk to the planned surface improvements.

The risk for owners associated with abandoning utilities in place include the potential for future differential settlement of existing trench fills, and/or partial collapse and potential ground loss into utility lines that are not completely filled with grout.

6.2 SITE CLEARING AND PREPARATION

6.2.1 Site Stripping

The site should be stripped of all surface vegetation, and surface and subsurface improvements (if present) within the proposed development area. Demolition of existing improvements is discussed in the prior paragraphs. A detailed discussion of removal of existing fills is provided later in this report. Surface vegetation and topsoil should be stripped to a sufficient depth to remove all material greater than 3 percent organic content by weight. Based on our site observations, surficial stripping should extend about 4 to 6 inches below existing grade in vegetated areas.

6.2.2 Tree and Shrub Removal

Trees and shrubs designated for removal should have the root balls and any roots greater than ½-inch diameter removed completely. Mature trees are estimated to have root balls extending to depths of 2 to 4 feet, depending on the tree size. Significant root zones are anticipated to extend to the diameter of the tree canopy. Grade depressions resulting from root ball removal should be cleaned of loose material and backfilled in accordance with the recommendations in the “Compaction” section of this report.

6.3 MITIGATION OF UNDOCUMENTED FILLS

As discussed, up to 6 feet of undocumented fill was encountered in our borings. Additionally, undocumented fill from previous swimming pool demolition may exist on the west-central portion

of the site and may be present beneath the proposed electrical building. The approximate limits of the former swimming pool are shown on the Site Plan, Figure 2. All undocumented fills should be completely removed from within building areas and to a lateral distance of at least 5 feet beyond the building footprint or to a lateral distance equal to fill depth below the perimeter footing, whichever is greater. Prior to construction, potholes should be performed at the proposed electrical building so that the stability of the undocumented fill can be evaluated by a Cornerstone representative. As a value-engineering decision, if the deep fills are left in place, some long-term compression is possible. If fills are not removed and replaced as engineered fill, at a minimum, we recommend, based on boring densities and blow counts, that at least the upper one to two feet be replaced as engineered fill.

Fills extending into planned pavement and flatwork areas may be left in place provided they are determined to be a low risk for future differential settlement and that the upper 12 to 18 inches of fill below pavement subgrade is re-worked and compacted as discussed in the "Compaction" section below. In our opinion, the fills encountered at this site are acceptable be left in place.

Provided the fills meet the "Material for Fill" requirements below, the fills may be reused when backfilling the excavations. Based on review of the samples collected from our borings, it appears that the fill may be reused. If materials are encountered that do not meet the requirements, such as debris, wood, trash, those materials should screen out of the remaining material and be removed from the site. Backfill of excavations should be placed in lifts and compacted in accordance with the "Compaction" section below.

6.4 TEMPORARY CUT AND FILL SLOPES

The contractor is responsible for maintaining all temporary slopes and providing temporary shoring where required. Temporary shoring, bracing, and cuts/fills should be performed in accordance with the strictest government safety standards. On a preliminary basis, the upper 10 feet at the site may be classified as OSHA Site C materials.

Excavations performed during site demolition and fill removal should be sloped at 3:1 (horizontal:vertical) within the upper 5 feet below building subgrade. Actual excavation inclinations should be reviewed in the field during construction, as needed. Excavations below building subgrade and excavations in pavement and flatwork areas should be sloped in accordance with OSHA soil classification requirements.

6.5 SUBGRADE PREPARATION

6.5.1 General Subgrade Preparation

After site clearing and demolition is complete, and prior to backfilling any excavations resulting from fill removal or demolition, the excavation subgrade and subgrade within areas to receive additional site fills, slabs-on-grade and/or pavements should be scarified to a depth of 12 inches, moisture conditioned, and compacted in accordance with the "Compaction" section below.

6.5.2 Synthetic Turf Field Subgrade Preparation

We understand that synthetic turf is being considered for the proposed fields. If chosen, the future turf system will likely consist of a synthetic turf with drainage composite surface overlying drainage layer overlying prepared subgrade. The guide specification should be followed for the drainage system that is chosen for this project. The geotechnical aspects of the project design details and specifications should be reviewed by our firm prior to project bidding and construction.
Once a synthetic turf system is chosen for the project, we should be consulted -to provide additional recommendations.

6.6 WET SOIL STABILIZATION GUIDELINES

Native soil and fill materials, especially soils with high fines contents such as clays and silty soils, can become unstable due to high moisture content, whether from high in-situ moisture contents or from winter rains. As the moisture content increases over the laboratory optimum, it becomes more likely the materials will be subject to softening and yielding (pumping) from construction loading or become unworkable during placement and compaction.

As discussed in the “Subsurface” section in this report, the in-situ moisture contents are up to 10 percent over the estimated laboratory optimum in the upper 10 feet of the soil profile. The contractor should anticipate drying the soils prior to reusing them as fill. In addition, repetitive rubber-tire loading will likely de-stabilize the soils.

There are several methods to address potential unstable soil conditions and facilitate fill placement and trench backfill. Some of the methods are briefly discussed below. Implementation of the appropriate stabilization measures should be evaluated on a case-by-case basis according to the project construction goals and the site conditions.

6.6.1 Scarification and Drying

The subgrade may be scarified to a depth of 8 to 12 inches and allowed to dry to near optimum conditions if sufficient dry weather is anticipated to allow sufficient drying. More than one round of scarification may be needed to break up the soil clods.

6.6.2 Removal and Replacement

As an alternative to scarification, the contractor may choose to over-excavate the unstable soils and replace them with dry on-site or import materials. A Cornerstone representative should be present to provide recommendations regarding the appropriate depth of over-excavation, whether a geosynthetic (stabilization fabric or geogrid) is recommended, and what materials are recommended for backfill.

6.7 MATERIAL FOR FILL

6.7.1 Re-Use of On-site Soils

On-site soils with an organic content less than 3 percent by weight may be reused as general fill. General fill should not have lumps, clods or cobble pieces larger than 6 inches in diameter; 85 percent of the fill should be smaller than 2½ inches in diameter. Minor amounts of oversize material (smaller than 12 inches in diameter) may be allowed provided the oversized pieces are not allowed to nest together and the compaction method will allow for loosely placed lifts not exceeding 12 inches.

6.7.2 Potential Import Sources

Non-expansive material should be inorganic with a Plasticity Index (PI) of 15 or less, and not contain recycled asphalt concrete where it will be used within the habitable building areas. Imported soil for use as general fill material should be inorganic with a Plasticity Index (PI) of 20 or less, and not contain recycled asphalt concrete where it will be used within the habitable building areas. To prevent significant caving during trenching or foundation construction, imported material should have sufficient fines. Samples of potential import sources should be delivered to our office at least 10 days prior to the desired import start date. Information regarding the import source should be provided, such as any site geotechnical reports. If the material will be derived from an excavation rather than a stockpile, potholes will likely be required to collect samples from throughout the depth of the planned cut that will be imported. At a minimum, laboratory testing will include PI tests. Material data sheets for select fill materials (Class 2 aggregate base, ¾-inch crushed rock, quarry fines, etc.) listing current laboratory testing data (not older than 6 months from the import date) may be provided for our review without providing a sample. If current data is not available, specification testing will need to be completed prior to approval.

Environmental and soil corrosion characterization should also be considered by the project team prior to acceptance. Suitable environmental laboratory data to the planned import quantity should be provided to the project environmental consultant; additional laboratory testing may be required based on the project environmental consultant's review. The potential import source should also not be more corrosive than the on-site soils, based on pH, saturated resistivity, and soluble sulfate and chloride testing.

6.8 COMPACTION REQUIREMENTS

All fills, and subgrade areas where fill, slabs-on-grade, and pavements are planned, should be placed in loose lifts 8 inches thick or less and compacted in accordance with ASTM D1557 (latest version) requirements as shown in the table below. In general, clayey soils should be compacted with sheepsfoot equipment and sandy/gravelly soils with vibratory equipment; open-graded materials such as crushed rock should be placed in lifts no thicker than 18 inches and consolidated in place with vibratory equipment. Each lift of fill and all subgrade should be firm and unyielding under construction equipment loading in addition to meeting the compaction requirements to be approved. The contractor (with input from a Cornerstone representative)

should evaluate the in-situ moisture conditions, as the use of vibratory equipment on soils with high moistures can cause unstable conditions. General recommendations for soil stabilization are provided in the "Wet Soil Stabilization Guidelines" section of this report. Where the soil's PI is 20 or greater, the expansive soil criteria should be used.

Table 3: Compaction Requirements

Description	Material Description	Minimum Relative[1] Compaction (percent)	Moisture[2] Content (percent)
General Fill (within upper 5 feet)	On-Site Expansive Soils	87 – 92	>3
	Low Expansion Soils	90	>1
General Fill (below a depth of 5 feet)	On-Site Expansive Soils	95	>3
	Low Expansion Soils	95	>1
Trench Backfill	On-Site Expansive Soils	87 – 92	>3
	Low Expansion Soils	90	>1
Trench Backfill (upper 6 inches of pavement subgrade)	On-Site Low Expansion Soils	95	>1
Crushed Rock Fill	¾-inch Clean Crushed Rock	Consolidate In-Place	NA
Non-Expansive Fill	Imported Non-Expansive Fill	90	Optimum
Flatwork Subgrade	On-Site Expansive Soils	87 - 92	>3
	Low Expansion Soils	90	>1
Flatwork Aggregate Base	Class 2 Aggregate Base[3]	90	Optimum
Pavement Subgrade	On-Site Expansive Soils	87 - 92	>3
	Low Expansion Soils	95	>1
Pavement Aggregate Base	Class 2 Aggregate Base[3]	95	Optimum
Field Permeable Base	Class II Permeable[4]	92[4]	>1
Asphalt Concrete	Asphalt Concrete	95 (Marshall)	NA

(1) Relative compaction based on maximum density determined by ASTM D1557 (latest version)
(2) Moisture content based on optimum moisture content determined by ASTM D1557 (latest version)
(3) Class 2 aggregate base shall conform to Caltrans Standard Specifications, latest edition, except that the relative compaction should be determined by ASTM D1557 (latest version)
(4) For Class II Permeable Base shall conform Caltrans Standard Specifications, latest edition, compact to 92 percent (do not over compact).

6.8.1 Construction Moisture Conditioning

Expansive soils can undergo significant volume change when dried then wetted. The contractor should keep all exposed expansive soil subgrade (and also trench excavation side walls) moist until protected by overlying improvements (or trenches are backfilled). If expansive soils are allowed to dry out significantly, re-moisture conditioning may require several days of re-wetting (flooding is not recommended), or deep scarification, moisture conditioning, and re-compaction.

6.9 TRENCH BACKFILL

Utility lines constructed within public right-of-way should be trenched, bedded and shaded, and backfilled in accordance with the local or governing jurisdictional requirements. Utility lines in private improvement areas should be constructed in accordance with the following requirements unless superseded by other governing requirements.

All utility lines should be bedded and shaded to at least 6 inches over the top of the lines with crushed rock (⅜-inch-diameter or greater) or well-graded sand and gravel materials conforming to the pipe manufacturer's requirements. Open-graded shading materials should be consolidated in place with vibratory equipment and well-graded materials should be compacted to at least 90 percent relative compaction with vibratory equipment prior to placing subsequent backfill materials.

General backfill over shading materials may consist of on-site native materials provided they meet the requirements in the "Material for Fill" section, and are moisture conditioned and compacted in accordance with the requirements in the "Compaction" section.

Where utility lines will cross perpendicular to strip footings, the footing should be deepened to encase the utility line, providing sleeves or flexible cushions to protect the pipes from anticipated foundation settlement, or the utility lines should be backfilled to the bottom of footing with sand-cement slurry or lean concrete. Where utility lines will parallel footings and will extend below the "foundation plane of influence," an imaginary 1:1 plane projected down from the bottom edge of the footing, either the footing will need to be deepened so that the pipe is above the foundation plane of influence, or the utility trench will need to be backfilled with sand-cement slurry or lean concrete within the influence zone. Sand-cement slurry used within foundation influence zones should have a minimum compressive strength of 75 psi.

On expansive soils sites it is desirable to reduce the potential for water migration into building and pavement areas through the granular shading materials. We recommend that a plug of low-permeability clay soil, sand-cement slurry, or lean concrete be placed within trenches just outside where the trenches pass into building and pavement areas.

6.10 SITE DRAINAGE

6.10.1 Site Surface Drainage

Ponding should not be allowed adjacent to building foundations, slabs-on-grade, pavements, hardscape areas, or field improvements. Hardscape surfaces should slope at least 2 percent towards suitable discharge facilities; landscape areas should slope at least 3 percent towards suitable discharge facilities. Roof runoff should be directed away from building areas in closed conduits, to approved infiltration facilities, or on to hardscaped surfaces that drain to suitable facilities. Retention, detention or infiltration facilities should be spaced at least 10 feet from buildings, and preferably at least 5 feet from slabs-on-grade or pavements. However, if retention, detention or infiltration facilities are located within these zones, we recommend that

these treatment facilities meet the requirements in the Storm Water Treatment Design Considerations section of this report.

6.11 LOW-IMPACT DEVELOPMENT (LID) IMPROVEMENTS

The Municipal Regional Permit (MRP) requires regulated projects to treat 100 percent of the amount of runoff identified in Provision C.3.d from a regulated project's drainage area with low impact development (LID) treatment measures onsite or at a joint stormwater treatment facility. LID treatment measures are defined as rainwater harvesting and use, infiltration, evapotranspiration, or biotreatment. A biotreatment system may only be used if it is infeasible to implement harvesting and use, infiltration, or evapotranspiration at a project site.

Technical infeasibility of infiltration may result from site conditions that restrict the operability of infiltration measures and devices. Various factors affecting the feasibility of infiltration treatment may create an environmental risk, structural stability risk, or physically restrict infiltration. The presence of any of these limiting factors may render infiltration technically infeasible for a proposed project. To aid in determining if infiltration may be feasible at the site, we provide the following site information regarding factors that may aid in determining the feasibility of infiltration facilities at the site.

- The near-surface soils at the site are clayey and categorized as Hydrologic Soil Group C and is expected to have infiltration rates of between about 0.06 to 0.57 inches per hour. In our opinion, these clayey soils will significantly limit the infiltration of stormwater.

- Locally, seasonal high groundwater is mapped at a depth of 10 to 12 feet, and therefore is expected to be within 10 feet of the base of the infiltration measure.

- In our opinion, infiltration locations within 10 feet of the buildings would create a geotechnical hazard.

6.11.1 Storm Water Treatment Design Considerations

If storm water treatment improvements, such as shallow bio-retention swales, basins or pervious pavements, are required as part of the site improvements to satisfy Storm Water Quality (C.3) requirements, we recommend the following items be considered for design and construction.

6.11.1.1 General Bioswale Design Guidelines

- If possible, avoid placing bioswales or basins within 10 feet of the building perimeter or within 5 feet of exterior flatwork or pavements. If bioswales must be constructed within these setbacks, the side(s) and bottom of the trench excavation should be lined with 10-mil visqueen to reduce water infiltration into the surrounding expansive clay.

- Bioswales constructed within 3 feet of proposed buildings may be within the foundation zone of influence for perimeter wall loads. Therefore, where bioswales will parallel

foundations and will extend below the "foundation plane of influence," an imaginary 1:1 plane projected down from the bottom edge of the foundation, the foundation will need to be deepened so that the bottom edge of the bioswale filter material is above the foundation plane of influence.

- The bottom of bioswale or detention areas should include a perforated drain placed at a low point, such as a shallow trench or sloped bottom, to reduce water infiltration into the surrounding soils near structural improvements, and to address the low infiltration capacity of the on-site clay soils.

6.11.1.2 Bioswale Infiltration Material

- Gradation specifications for bioswale filter material, if required, should be specified on the grading and improvement plans.

- Compaction requirements for bioswale filter material in non-landscaped areas or in pervious pavement areas, if any, should be indicated on the plans and specifications to satisfy the anticipated use of the infiltration area.

- If bioswales are to be vegetated, the landscape architect should select planting materials that do not reduce or inhibit the water infiltration rate, such as covering the bioswale with grass sod containing a clayey soil base.

- Due to the relatively loose consistency and/or high organic content of many bioswale filter materials, long-term settlement of the bioswale medium should be anticipated. To reduce initial volume loss, bioswale filter material should be wetted in 12-inch lifts during placement to pre-consolidate the material. Mechanical compaction should not be allowed, unless specified on the grading and improvement plans, since this could significantly decrease the infiltration rate of the bioswale materials.

- It should be noted that the volume of bioswale filter material may decrease over time depending on the organic content of the material. Additional filter material may need to be added to bioswales after the initial exposure to winter rains and periodically over the life of the bioswale areas, as needed.

6.11.1.3 Bioswale Construction Adjacent to Pavements

If bio-infiltration swales or basins are considered adjacent to proposed parking lots or exterior flatwork, we recommend that mitigative measures be considered in the design and construction of these facilities to reduce potential impacts to flatwork or pavements. Exterior flatwork, concrete curbs, and pavements located directly adjacent to bio-swales may be susceptible to settlement or lateral movement, depending on the configuration of the bioswale and the setback between the improvements and edge of the swale. To reduce the potential for distress to these improvements due to vertical or lateral movement, the following options should be considered by the project civil engineer:

- Improvements should be setback from the vertical edge of a bioswale such that there is at least 1 foot of horizontal distance between the edge of improvements and the top edge of the bioswale excavation for every 1 foot of vertical bioswale depth, or

- Concrete curbs for pavements, or lateral restraint for exterior flatwork, located directly adjacent to a vertical bioswale cut should be designed to resist lateral earth pressures in accordance with the recommendations in the "Retaining Walls" section of this report, or concrete curbs or edge restraint should be adequately keyed into the native soil or engineered to reduce the potential for rotation or lateral movement of the curbs.

6.12 LANDSCAPE CONSIDERATIONS

Since the near-surface soils are moderately to highly expansive, we recommend greatly reducing the amount of surface water infiltrating these soils near foundations and exterior slabs-on-grade. This can typically be achieved by:

- Using drip irrigation

- Avoiding open planting within 3 feet of the building perimeter or near the top of existing slopes

- Regulating the amount of water distributed to lawns or planter areas by using irrigation timers

- Selecting landscaping that requires little or no watering, especially near foundations.

We recommend that the landscape architect consider these items when developing landscaping plans.

SECTION 7: 2019 CBC SEISMIC DESIGN CRITERIA

7.1 SEISMIC DESIGN CRITERIA

We understand that the project structural design will be based on the 2019 California Building Code (CBC), which provides criteria for the seismic design of buildings in Chapter 16. The "Seismic Coefficients" used to design buildings are established based on a series of tables and figures addressing different site factors, including the soil profile in the upper 100 feet below grade and mapped spectral acceleration parameters based on distance to the controlling seismic source/fault system.

Our explorations generally encountered very dense to hard clay and loose to medium dense sand deposits to a depth of 30 feet, the maximum depth explored. Based on our borings and review of local geology, the site is underlain by deep alluvial soils with typical SPT "N" values between 15 and 50 blows per foot. Therefore, we have classified the site as Soil Classification D. Because we used site specific data from our explorations and laboratory testing, the site class should be considered as "determined" for the purposes of estimating the seismic design

parameters from the code outlined below. The mapped spectral acceleration parameters S_s and S_1 were calculated using the web-based program ATC Hazards by Locations, located at hazards.atcouncil.org, based on the site coordinates presented below and the site classification. **Recommended values in the table below may only be used for design if in the judgement of the project structural engineer an exception can be taken per ASCE 7-16 Section 11.4.8.** The table below lists the various factors used to determine the seismic coefficients and other parameters.

Table 4: CBC Site Categorization and Site Coefficients

Classification/Coefficient	Design Value
Site Class	D
Site Latitude	37.475132°
Site Longitude	- 122.172310°
0.2-second Period Mapped Spectral Acceleration[1], S_S	1.5g
1-second Period Mapped Spectral Acceleration[1], S_1	0.6g
Short-Period Site Coefficient – Fa	1
Long-Period Site Coefficient – Fv	1.7[2]
0.2-second Period, Maximum Considered Earthquake Spectral Response Acceleration Adjusted for Site Effects - S_{MS}	1.5g
1-second Period, Maximum Considered Earthquake Spectral Response Acceleration Adjusted for Site Effects – S_{M1}	1.02g[2]
0.2-second Period, Design Earthquake Spectral Response Acceleration – S_{DS}	1g
1-second Period, Design Earthquake Spectral Response Acceleration – S_{D1}	0.68g[2]

(1) For Site Class B, 5 percent damped.
(2) These values may be used for design only if an exception has been taken per Section 11.4.8 of ASCE 7-16.

SECTION 8: FOUNDATIONS

8.1 SUMMARY OF RECOMMENDATIONS

We understand the project will include restoration of existing adobe structures and construction of a new electrical building and restrooms. In our opinion, the proposed structures for new construction or renovation may be supported on shallow foundations provided the recommendations in the “Earthwork” section and the sections below are followed. Optional foundation recommendations for drilled cast-in-place piers are also provided for other onsite improvements.

8.2 SHALLOW FOUNDATIONS

8.2.1 Conventional Shallow Footings

Conventional shallow footings should bear on natural, undisturbed soil or engineered fill, be at least 12 inches wide, and extend at least 18 inches below the lowest adjacent grade. Lowest adjacent grade is defined as the deeper of the following: 1) bottom of the adjacent interior slab-on-grade, or 2) finished exterior grade, excluding landscaping topsoil. The deeper footing embedment is due to the presence of moderately to highly expansive soils and is intended to embed the footing below the zone of significant seasonal moisture fluctuation, reducing the potential for differential movement.

Footings constructed to the above dimensions and in accordance with the "Earthwork" recommendations of this report are capable of supporting maximum allowable bearing pressures of 2,000 psf for dead loads, 3,000 psf for combined dead plus live loads, and 4,000 psf for all loads including wind and seismic. These pressures are based on factors of safety of 3.0, 2.0, and 1.5 applied to the ultimate bearing pressure for dead, dead plus live, and all loads, respectively. These pressures are net values; the weight of the footing may be neglected for the portion of the footing extending below grade (typically, the full footing depth). Top and bottom mats of reinforcing steel should be included in continuous footings to help span irregularities and differential settlement.

8.2.2 Footing Settlement

Structural loads were not provided to us at the time this report was prepared; therefore, we assumed the typical loading in the following table.

Table 5: Assumed Structural Loading

Foundation Area	Range of Assumed Loads
Interior Isolated Column Footing	20 to 50 kips
Exterior Isolated Column Footing	20 to 50 kips
Perimeter Strip Footing	1 to 3 kips per lineal foot

Based on the above loading and the allowable bearing pressures presented above, we estimate that the total static footing settlement will be on the order of ½ inch, with less than ¼ inch of post-construction differential settlement between adjacent foundation elements. As our footing loads were assumed, we recommend we be retained to review the final footing layout and loading and verify the settlement estimates above.

8.2.3 Lateral Loading

Lateral loads may be resisted by friction between the bottom of footing and the supporting subgrade, and also by passive pressures generated against footing sidewalls. An ultimate frictional resistance of 0.45 applied to the footing dead load, and an ultimate passive pressure

based on an equivalent fluid pressure of 450 pcf may be used in design. The structural engineer should apply an appropriate factor of safety (such as 1.5) to the ultimate values above. Where footings are adjacent to landscape areas without hardscape, the upper 12 inches of soil should be neglected when determining passive pressure capacity.

8.2.4 Conventional Shallow Footing Construction Considerations

Where utility lines will cross perpendicular to strip footings, the footing should be deepened to encase the utility line, providing sleeves or flexible cushions to protect the pipes from anticipated foundation settlement, or the utility lines should be backfilled to the bottom of footing with sand-cement slurry or lean concrete. Where utility lines will parallel footings and will extend below the "foundation plane of influence," an imaginary 1:1 plane projected down from the bottom edge of the footing, either the footing will need to be deepened so that the pipe is above the foundation plane of influence, or the utility trench will need to be backfilled with sand-cement slurry or lean concrete within the influence zone. Sand-cement slurry used within foundation influence zones should have a minimum compressive strength of 75 psi.

Footing excavations should be filled as soon as possible or be kept moist until concrete placement by regular sprinkling to prevent desiccation. A Cornerstone representative should observe all footing excavations prior to placing reinforcing steel and concrete. If there is a significant schedule delay between our initial observation and concrete placement, we may need to re-observe the excavations.

Due to the presence of clean sand and gravel, footing excavation walls will likely not stand vertical and will need to be sloped to a minimum 1:1 inclination or Stay-Form or similar may need to be placed within the footing excavations as they are excavated during construction of the foundation elements. Granular material encountered in the footing bottoms will likely be disturbed to a depth of 6 to 8 inches following excavation and will need to be compacted to 90 percent relative compaction prior to steel placement. Care should be taken to not disturb the compacted granular material during steel placement. We should re-observe the footing excavations in granular materials after reinforcing steel has been placed and just prior to concrete placement. Footing excavations should also be kept moist by regular sprinkling with water to prevent desiccation and potential raveling of the granular materials. As an alternative, a rat slab can be placed over the granular material after we have observed the footing excavation to protect the granular material prior to steel placement.

8.3 DEEP FOUNDATIONS

8.3.1 Drilled Piers

Shade structures may be supported on drilled, cast-in-place, straight-shaft friction piers. The piers should have a minimum diameter of 12 inches and extend to a depth of at least 4 feet below the bottom of the grade beams. Adjacent piers centers should be spaced at least three diameters apart, otherwise, a reduction for group effects may be required. Grade beams should span between piers and/or pier caps in accordance with structural requirements. Conventional

slabs-on-grade may be used provided the subgrade soils are prepared in accordance with the "Earthwork" section.

8.3.1.1 Vertical Capacity

The vertical capacity of the piers may be designed based on an allowable skin friction of 500 psf for combined dead plus live loads based on a factor of safety of 2.0; dead loads should not exceed two-thirds of the allowable capacities. The allowable skin friction may be increased by one-third for wind and seismic loads. Frictional resistance to uplift loads may be developed along the pier shafts based on an ultimate frictional resistance of 80 percent of the downward capacity; the structural engineer should apply an appropriate factor of safety (such as 1.5) to the ultimate uplift capacity.

8.3.1.2 Lateral Capacity

Lateral loads exerted on the pier-supported structure may be resisted by a passive resistance based on an allowable equivalent fluid pressure of 300 pcf acting against twice the projected area of piers below the pier cap and over two pier diameters for single piers, up to a maximum allowable uniform pressure of 2,500 psf based on a factor of safety of 2.0. The upper 1 foot of soil or depth of landscaping, whichever is greater, should be neglected when determining lateral capacity.

8.3.1.3 Drilled Pier Construction Considerations

The excavation of all drilled shafts should be observed by a Cornerstone representative to confirm the soil profile, verify that the piers extend the minimum depth into suitable materials, and that the piers are constructed in accordance with our recommendations and project requirements. The drilled shafts should be straight, dry, and relatively free of loose material before reinforcing steel is installed and concrete is placed. If groundwater cannot be removed from the excavations prior to concrete placement, drilling slurry or casing may be required to stabilize the shaft and the concrete should be placed using a tremie pipe, keeping the tremie pipe below the surface of the concrete to avoid entrapment of water or drilling slurry in the concrete.

SECTION 9: CONCRETE SLABS AND PEDESTRIAN PAVEMENTS

9.1 INTERIOR SLABS-ON-GRADE

Due to the moderate to high expansion potential of the surficial soils, the proposed slabs-on-grade should be supported on at least 12 inches of non-expansive fill (NEF) to reduce the potential for slab damage due to soil heave. The NEF layer should be constructed over subgrade prepared in accordance with the recommendations in the "Earthwork" section of this report. If moisture-sensitive floor coverings are planned, the recommendations in the "Interior Slabs Moisture Protection Considerations" section below may be incorporated in the project design if desired. If significant time elapses between initial subgrade preparation and NEF construction, the subgrade should be proof-rolled to confirm subgrade stability, and if the soil

has been allowed to dry out, the subgrade should be re-moisture conditioned to at least 3 percent over the optimum moisture content.

The structural engineer should determine the appropriate slab reinforcement for the loading requirements and considering the expansion potential of the underlying soils. For unreinforced concrete slabs, ACI 302.1R recommends limiting control joint spacing to 24 to 36 times the slab thickness in each direction, or a maximum of 18 feet.

9.2 INTERIOR SLABS MOISTURE PROTECTION CONSIDERATIONS

The following general guidelines for concrete slab-on-grade construction where floor coverings are planned are presented for the consideration by the developer, design team, and contractor. These guidelines are based on information obtained from a variety of sources, including the American Concrete Institute (ACI) and are intended to reduce the potential for moisture-related problems causing floor covering failures, and may be supplemented as necessary based on project-specific requirements. The application of these guidelines or not will not affect the geotechnical aspects of the slab-on-grade performance.

- Place a minimum 15-mil vapor retarder conforming to ASTM E 1745, Class C requirements or better directly below the concrete slab; the vapor retarder should extend to the slab edges and be sealed at all seams and penetrations in accordance with manufacturer's recommendations and ASTM E 1643 requirements. A 4-inch-thick capillary break, consisting of crushed rock should be placed below the vapor retarder and consolidated in place with vibratory equipment. The mineral aggregate shall be of such size that the percentage composition by dry weight as determined by laboratory sieves will conform to the following gradation:

Sieve Size	Percentage Passing Sieve
1"	100
¾"	90 – 100
No. 4	0 – 10
No. 200	0 – 5

  The capillary break rock may be considered as the upper 4 inches of the non-expansive fill previously recommended.

- The concrete water:cement ratio should be 0.45 or less. Mid-range plasticizers may be used to increase concrete workability and facilitate pumping and placement.

- Water should not be added after initial batching unless the slump is less than specified and/or the resulting water:cement ratio will not exceed 0.45.

- Polishing the concrete surface with metal trowels is not recommended.

- Where floor coverings are planned, all concrete surfaces should be properly cured.

- Water vapor emission levels and concrete pH should be determined in accordance with ASTM F1869-98 and F710-98 requirements and evaluated against the floor covering manufacturer's requirements prior to installation.

9.3 EXTERIOR FLATWORK

9.3.1 Pedestrian Concrete Flatwork

Exterior flatwork, such as pedestrian walkways, patios, driveways, hardscaped areas, sports facilities such as tennis courts, and sidewalks, may experience seasonal movement due to the native expansive soils; therefore, some cracking or vertical movement of conventional slabs should be anticipated where imported fill is not planned in flatwork areas. There are several alternatives for mitigating the impacts of expansive soils beneath concrete flatwork. We are providing recommendations to reduce distress to concrete flatwork that includes moisture conditioning the subgrade soils, using non-expansive fill, and providing adequate construction and control joints to control cracks that do occur. It should be noted that minor slab movement or localized cracking and/or distress could still occur.

- The minimum recommendation for concrete flatwork constructed on moderately to highly expansive soils is to properly prepare the clayey soils prior to placing concrete. This is typically achieved by scarifying, moisture conditioning, and re-compacting the subgrade soil. Subgrade soil should be moisture conditioned to at least 3 percent over the laboratory optimum and compacted using moderate compaction effort to a relative compaction of 87 to 92 percent (ASTM Test Method D1557). Since the near surface soils may have been previously compacted and tested, the subgrade soils could possibly be moisture conditioned by gradually wetting the soil, depending on the time of year slab construction occurs. This should not include flooding or excessively watering the soil, which would likely result in a soft, unstable subgrade condition, and possible delays in the construction while waiting for the soil to dry out. In general, the subgrade should be relatively firm and non-yielding prior to construction.

- Concrete flatwork, excluding pavements that would be subject to wheel loads, should be at least 4 inches thick and underlain by at least 6 inches of non-expansive fill. Non-expansive fill may include aggregate base, crushed rock, or imported soil with a PI of 15 or less. Non-expansive fill should be compacted to at least 90 percent relative compaction. Flatwork that will be subject to heavier or frequent vehicular loading should be designed in accordance with the recommendations in the "Vehicular Pavements" section below.

- We recommend a maximum control joint spacing of about 2 feet in each direction for each inch of concrete thickness and a construction joint spacing of 10 to 12 feet. Construction joints that abut the foundations or garage slabs should include a felt strip, or approved equivalent, that extends the full depth of the exterior slab. This will help to reduce the potential for permanent vertical offset between the slabs due to friction between the concrete edges. We recommend that exterior slabs be isolated from adjacent foundations.

At the owner's option, if desired to reduce the potential for vertical offset or widening of concrete cracks, consideration should be given to using reinforcing steel, such as No. 3 rebar spaced at 18 inches on center each direction.

9.3.2 Pedestrian Pavers

Concrete unit pavers subject to pedestrian and/or occasional light pick up loading should be at least 60 mm thick and supported on at least 6 inches of Class 2 aggregate base overlying subgrade prepared in accordance with the "Earthwork" recommendations of this report. Pavers that will be subject to vehicular loading should be designed in accordance with the recommendations in the "Vehicular Pavements" section below.

9.3.3 Pedestrian Pervious Pavers

We understand pedestrian pervious interlocking concrete pavers (PICP) may be used at the site.

The pervious interlocking concrete paver recommendations presented in this section are based on standard concrete interlocking paver design methods and guidelines presented by the Interlocking Concrete Pavement Institute (www.icpi.org). The PICP section should consist of three drainage layers: an upper bedding layer, a middle base layer, and a lower sub-base layer. Due to the low infiltration rate of the native clay subgrade soils, pervious paver systems should be designed for partial exfiltration, which assumes only a portion of the collected storm water will infiltrate into underlying subgrade soils while the remainder is drained by perforated subdrains.

The pedestrian PICP drainage layers should consist of the materials presented in the following table.

Table 6: Pervious Interlocking Concrete Paver Materials

Section Layer	Minimum Layer Thickness (inches)	Material Type
Bedding	2	ASTM No. 8
Base	6	ASTM No. 57

(1) Base should be underlain by woven geotextile stabilization fabric, such as Mirafi HP270 or approved equivalent

9.3.3.1 Design Assumptions

1. All granular paver materials to consist of crushed aggregate. Rounded or sub-rounded gravel is not acceptable.
2. All granular paver materials should have less than 2 percent passing the No. 200 sieve.

3. Joint filler for pervious bricks with narrow joints between blocks should confirm to manufacturer requirements. Joint filler for impervious bricks with wide joints should consist of ⅛ to ¼ inch angular, crushed aggregate conforming to ASTM No. 9 or No. 89 material. It should be noted that the maximum size of the joint filler sand should be less than the annular space between pavers to allow filler material to flow freely into the joints without clogging at the surface.
4. The exposed subgrade soils in PICP areas should be proof-rolled with a static smooth-drummed roller and be found to be stable prior to placement of geotextile fabric. Pumping or deflecting subgrade may require additional drying or over-excavation and replacement.
5. The base material should be placed over a layer of woven geotextile stabilization fabric, consisting of Mirafi HP270 or approved equivalent placed over exposed subgrade soils and at least 12 inches up the sides of the excavation area. Geotextile fabric should be placed in accordance with manufacturer's requirements and observed by a Cornerstone representative during construction prior to placing the sub-base layer.
6. Due to the low infiltration rate of the native clay subgrade soil, a subdrain should be placed within the subbase layer that consists of a minimum 4-inch diameter PVC SDR35 pipe with perforations placed down. If possible, the bottom of the subdrain should be placed no more than 6 inches above the lowest subgrade elevation and be bedded and shaded with No. 57 drain rock that extends at least 2 to 3 inches below the bottom and 3 to 4 inches above the top of the subdrain pipe. The subdrain should be sloped at least 0.5 percent and discharge to a free draining outlet, such as a nearby storm drain.
7. Once the geotextile fabric and subdrain system has been constructed, each layer of granular base material should be densified with vibratory, smooth-drummed compaction equipment prior to placing subsequent lifts. A minimum of 2 vibratory and 2 static passes should be made on maximum 6-inch lifts, depending on the type of equipment used.
8. The actual drain rock thickness should be determined by the project civil engineer based on anticipated storm water flow.
9. Upon completion of paver and joint sand installation, the paver surface should be compacted with a minimum of three passes with smooth drum vibratory compaction equipment.
10. Design and construction of pervious concrete unit pavers, including placement and consolidation of drain rock materials and joint sand placement, should be performed by qualified pervious concrete paver suppliers and contractors in accordance with Interlocking Concrete Pavement Institute guidelines and the project specifications.

9.3.4 Pedestrian Trails

Standard sections from local public agencies are typically used for pedestrian trails (used for walking, biking, etc.) and frequently consist of 2 inches of asphalt concrete over 4 to 6 inches of aggregate base and are typically 8 to 12 feet wide, with 2-foot aggregate shoulders. However, pedestrian trails can be severely distressed due to expansive soils and poor construction techniques during construction on expansive soils. For this reason, if it is desired to mitigate for expansive soils to reduce the amount of distress to trails due to seasonal expansion/contraction

and differential movement, we recommend a layer of non-expansive fill and the compaction of expansive subgrade soils in accordance with the Earthwork recommendations of this report.

At a minimum, pedestrian trails should have asphalt and aggregate base sections consistent with the existing trail sections. In addition, if the new trail areas are to be designed to reduce the potential for distress due to expansive soils as discussed above, at least 2 inches of non-expansive fill should underly any planned asphalt concrete and baserock assuming a minimum 4 inches of baserock, and extend to the edge of the shoulders, or at least 12 inches beyond the trail edge, whichever is greater. Alternately, chemical treatment of the soil to stabilize subgrade could be performed in-place to mitigate for expansive soils. If the trail is to be used by vehicular traffic, we should be consulted to provide further pavement recommendations based on the anticipated loading.

SECTION 10: VEHICULAR PAVEMENTS

10.1 ASPHALT CONCRETE

The following asphalt concrete pavement recommendations tabulated below are based on the Procedure 608 of the Caltrans Highway Design Manual, estimated traffic indices for various pavement-loading conditions, and on a design R-value of 5. The design R-value was chosen based on engineering judgement considering the variable and expansive soil conditions.

Table 7: Asphalt Concrete Pavement Recommendations

Design Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base* (inches)	Total Pavement Section Thickness (inches)
4.0	2.5	7.5	10.0
4.5	2.5	9.5	12.0
5.0	3.0	10.0	13.0
5.5	3.0	12.0	15.0
6.0	3.5	13.0	16.5
6.5	4.0	13.5	17.5

(1) Caltrans Class 2 aggregate base; minimum R-value of 78; subgrade R-value of 5

10.2 PORTLAND CEMENT CONCRETE

The Portland Cement Concrete (PCC) pavement recommendations outlined below are based on methods presented in American Concrete Pavement Association (ACPA, 2006). We have provided a few pavement alternatives as an anticipated Average Daily Truck Traffic (ADTT) was not provided. The following table presents minimum PCC pavements thicknesses for various traffic loading categories and the anticipated maximum Average Daily Truck Traffic (ADTT).

Table 8: PCC Pavement Recommendations

Allowable ADTT	Minimum PCC Thickness[1] (inches)
3	5.0
20 to 50	6.0

(1) Subgrade design R-Value = 5

The PCC thicknesses above are based on a concrete compressive strength of at least 3,500 psi, supporting the PCC on at least 6 inches of Class 2 aggregate base compacted as recommended in the "Earthwork" section, and laterally restraining the PCC with curbs or concrete shoulders. Adequate expansion and control joints should be included. Consideration should be given to limiting the control joint spacing to a maximum of about 2 feet in each direction for each inch of concrete thickness. Due to the expansive surficial soils present, we recommend that the construction and expansion joints be dowelled.

10.3 VEHICULAR PERVIOUS PAVERS

The plans indicate pervious interlocking concrete pavers (PICP) are being used to address storm water quality design requirements for the project. Pervious pavers will be used in parking stall areas only.

The pervious interlocking concrete paver recommendations presented in this section are based on standard concrete interlocking paver design methods and guidelines presented by the Interlocking Concrete Pavement Institute (www.icpi.org). The PICP section should consist of three drainage layers: an upper bedding layer, a middle base layer, and a lower sub-base layer. Due to the low infiltration rate of the native clay subgrade soils, pervious paver systems should be designed for partial exfiltration, which assumes only a portion of the collected storm water will infiltrate into underlying subgrade soils while the remainder is drained by perforated subdrains.

Where vehicular pervious concrete unit pavers are desired in vehicle parking bays, we recommend that the pavers be underlain by granular base material (not including the bedding layer) as summarized in the following table. The minimum paver section thicknesses for these areas are based on a revised Traffic Index of 5.0 for parking bays. The PICP drainage layers should consist of the materials presented in the following table.

Table 9: Pervious Interlocking Concrete Paver Materials

Section Layer	Minimum Layer Thickness (inches)	Material Type
Bedding	2	ASTM No. 8
Base	4	ASTM No. 57
Sub-Base(1)	8	ASTM No. 2

(1) Subbase should be underlain by woven geotextile stabilization fabric, such as Mirafi HP270 or approved equivalent

10.3.1 Design Assumptions

1. All granular paver materials to consist of crushed aggregate. Rounded or sub-rounded gravel is not acceptable.
2. All granular paver materials should have less than 2 percent passing the No. 200 sieve.
3. Joint filler for pervious bricks with narrow joints between blocks should confirm to manufacturer requirements. Joint filler for impervious bricks with wide joints should consist of ⅛ to ¼ inch angular, crushed aggregate conforming to ASTM No. 9 or No. 89 material. It should be noted that the maximum size of the joint filler sand should be less than the annular space between pavers to allow filler material to flow freely into the joints without clogging at the surface.
4. The exposed subgrade soils in PICP areas should be proof-rolled with a static smooth-drummed roller and be found to be stable prior to placement of geotextile fabric. Pumping or deflecting subgrade may require additional drying or over-excavation and replacement.
5. The granular base material should be placed over a layer of woven geotextile stabilization fabric, consisting of Mirafi HP270 or approved equivalent placed over exposed subgrade soils and at least 12 inches up the sides of the excavation area. Geotextile fabric should be placed in accordance with manufacturer's requirements and observed by a Cornerstone representative during construction prior to placing the sub-base layer.
6. Due to the low infiltration rate of the native clay subgrade soil, a subdrain should be placed within the subbase layer that consists of a minimum 4-inch diameter PVC SDR35 pipe with perforations placed down. If possible, the bottom of the subdrain should be placed no more than 6 inches above the lowest subgrade elevation and be bedded and shaded with No. 57 drain rock that extends at least 2 to 3 inches below the bottom and 3 to 4 inches above the top of the subdrain pipe. The subdrain should be sloped at least 0.5 percent and discharge to a free draining outlet, such as a nearby storm drain.
7. Once the geotextile fabric and subdrain system has been constructed, each layer of granular base material should be densified with vibratory, smooth-drummed compaction

equipment prior to placing subsequent lifts. A minimum of 2 vibratory and 2 static passes should be made on maximum 6-inch lifts, depending on the type of equipment used.

8. The actual drain rock thickness should be determined by the project civil engineer based on anticipated storm water flow.
9. A subgrade R-value of 5 was used for paver design.
10. Pervious interlocking concrete pavers should be laterally restrained by Portland Cement Concrete curbs that extend at least 4 inches below adjacent subgrade soils.
11. Upon completion of paver and joint sand installation, the paver surface should be compacted with a minimum of three passes with smooth drum vibratory compaction equipment.
12. Design and construction of pervious concrete unit pavers, including placement and consolidation of drain rock materials and joint sand placement, should be performed by qualified pervious concrete paver suppliers and contractors in accordance with Interlocking Concrete Pavement Institute guidelines and the project specifications.

10.4 PAVEMENT CUTOFF

Surface water penetration into the pavement section can significantly reduce the pavement life, due to the native expansive clays. While quantifying the life reduction is difficult, a normal 20-year pavement design could be reduced to less than 10 years; therefore, increased long-term maintenance may be required.

It would be beneficial to include a pavement cut-off, such as deepened curbs, redwood-headers, or “Deep-Root Moisture Barriers” that are keyed at least 4 inches into the pavement subgrade. This will help limit the additional long-term maintenance.

SECTION 11: RETAINING WALLS

11.1 STATIC LATERAL EARTH PRESSURES

The structural design of any site retaining wall should include resistance to lateral earth pressures that develop from the soil behind the wall, any undrained water pressure, and surcharge loads acting behind the wall. Provided a drainage system is constructed behind the wall to prevent the build-up of hydrostatic pressures as discussed in the section below, we recommend that the walls with level backfill be designed for the following pressures:

Table 10: Recommended Lateral Earth Pressures

Wall Condition	Lateral Earth Pressure[1]	Additional Surcharge Loads
Unrestrained – Cantilever Wall	45 pcf	⅓ of vertical loads at top of wall
Restrained – Braced Wall	45 pcf + $8H^2$ psf	½ of vertical loads at top of wall

(1) Lateral earth pressures are based on an equivalent fluid pressure for level backfill conditions
(2) H is the distance in feet between the bottom of footing and top of retained soil

11.2 SEISMIC LATERAL EARTH PRESSURES

The 2019 CBC states that lateral pressures from earthquakes should be considered in the design of basements and retaining walls. At this time, we are not aware of any retaining walls for the project. However, minor landscaping walls (i.e. walls 6 feet or less in height) may be proposed. In our opinion, design of these walls for seismic lateral earth pressures in addition to static earth pressures is not warranted.

11.3 WALL DRAINAGE

Adequate drainage should be provided to at-grade site walls by a subdrain system behind all walls. This system should consist of a 4-inch minimum diameter perforated pipe placed near the base of the wall (perforations placed downward). The pipe should be bedded and backfilled with Class 2 Permeable Material per Caltrans Standard Specifications, latest edition. The permeable backfill should extend at least 12 inches out from the wall and to within 2 feet of outside finished grade. Alternatively, ½-inch to ¾-inch crushed rock may be used in place of the Class 2 Permeable Material provided the crushed rock and pipe are enclosed in filter fabric, such as Mirafi 140N or approved equivalent. The upper 2 feet of wall backfill should consist of compacted on-site soil. The subdrain outlet should be connected to a free-draining outlet or sump.

Miradrain, Geotech Drainage Panels, or equivalent drainage matting can be used for wall drainage as an alternative to the Class 2 Permeable Material or drain rock backfill. Horizontal strip drains connecting to the vertical drainage matting may be used in lieu of the perforated pipe and crushed rock section. The vertical drainage panel should be connected to the perforated pipe or horizontal drainage strip at the base of the wall, or to some other closed or through-wall system such as the TotalDrain system from AmerDrain. Sections of horizontal drainage strips should be connected with either the manufacturer's connector pieces or by pulling back the filter fabric, overlapping the panel dimples, and replacing the filter fabric over the connection. At corners, a corner guard, corner connection insert, or a section of crushed rock covered with filter fabric must be used to maintain the drainage path.

Drainage panels should terminate 18 to 24 inches from final exterior grade. The Miradrain panel filter fabric should be extended over the top of and behind the panel to protect it from intrusion of the adjacent soil.

11.4 BACKFILL

Where surface improvements will be located over the retaining wall backfill, backfill placed behind the walls should be compacted to at least 95 percent relative compaction using light compaction equipment. Where no surface improvements are planned, backfill should be compacted to at least 90 percent. If heavy compaction equipment is used, the walls should be temporarily braced.

11.5 FOUNDATIONS

Retaining walls may be supported on a continuous and or spread footing designed in accordance with the recommendations presented in the “Foundations” section of this report.

SECTION 12: LIMITATIONS

This report, an instrument of professional service, has been prepared for the sole use of CMG Landscape Architecture specifically to support the design of the Reimagine Flood Park project in Menlo Park, California. The opinions, conclusions, and recommendations presented in this report have been formulated in accordance with accepted geotechnical engineering practices that exist in Northern California at the time this report was prepared. No warranty, expressed or implied, is made or should be inferred.

Recommendations in this report are based upon the soil and groundwater conditions encountered during our subsurface exploration. If variations or unsuitable conditions are encountered during construction, Cornerstone must be contacted to provide supplemental recommendations, as needed.

CMG Landscape Architecture may have provided Cornerstone with plans, reports and other documents prepared by others. CMG Landscape Architecture understands that Cornerstone reviewed and relied on the information presented in these documents and cannot be responsible for their accuracy.

Cornerstone prepared this report with the understanding that it is the responsibility of the owner or his representatives to see that the recommendations contained in this report are presented to other members of the design team and incorporated into the project plans and specifications, and that appropriate actions are taken to implement the geotechnical recommendations during construction.

Conclusions and recommendations presented in this report are valid as of the present time for the development as currently planned. Changes in the condition of the property or adjacent properties may occur with the passage of time, whether by natural processes or the acts of other persons. In addition, changes in applicable or appropriate standards may occur through legislation or the broadening of knowledge. Therefore, the conclusions and recommendations presented in this report may be invalidated, wholly or in part, by changes beyond Cornerstone’s control. This report should be reviewed by Cornerstone after a period of three (3) years has elapsed from the date of this report. In addition, if the current project design is changed, then Cornerstone must review the proposed changes and provide supplemental recommendations, as needed.

An electronic transmission of this report may also have been issued. While Cornerstone has taken precautions to produce a complete and secure electronic transmission, please check the electronic transmission against the hard copy version for conformity.

Recommendations provided in this report are based on the assumption that Cornerstone will be retained to provide observation and testing services during construction to confirm that conditions are similar to that assumed for design, and to form an opinion as to whether the work has been performed in accordance with the project plans and specifications. If we are not retained for these services, Cornerstone cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of Cornerstone's report by others. Furthermore, Cornerstone will cease to be the Geotechnical-Engineer-of-Record if we are not retained for these services.

SECTION 13: REFERENCES

Aagaard, B.T., Blair, J.L., Boatwright, J., Garcia, S.H., Harris, R.A., Michael, A.J., Schwartz, D.P., and DiLeo, J.S., 2016, Earthquake outlook for the San Francisco Bay region 2014–2043 (ver. 1.1, August 2016): U.S. Geological Survey Fact Sheet 2016–3020, 6 p., http://dx.doi.org/10.3133/fs20163020.

ATC Hazards by Location, Hazards by Location, 2020, https://hazards.atcouncil.org/

American Concrete Pavement Association (ACPA, 2006). *Design of Concrete Pavement for Streets and Roads.*

ASCE 7-16. American Society of Civil Engineers. (2016). *Minimum Design Loads and Associated Criteria for Buildings and Other Structures.*

California Building Code, 2019, Structural Engineering Design Provisions, Vol. 2.

California Department of Conservation Division of Mines and Geology, 1998, Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada, International Conference of Building Officials, February, 1998.

California Division of Mines and Geology (2008), "Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117A, September.

California Geological Survey, 2006, State of California Seismic Hazard Zones, Palo Alto 7.5-Minute Quadrangle, California: Seismic Hazard Zone Report 111.

CGS. (2021). *Earthquake Zones of Required Investigation.* CGS Homepage. https://maps.conservation.ca.gov/cgs/EQZApp/app/

Federal Emergency Management Administration (FEMA), 2009, FIRM City of Palo Alto, California, Community Panel #06081C0306F.

Idriss, I.M., and Boulanger, R.W., 2008, Soil Liquefaction During Earthquakes, Earthquake Engineering Research Institute, Oakland, CA, 237 p.

Knudsen et al., 2000, Preliminary Maps of Quaternary Deposits and Liquefaction Susceptibility, Nine-County San Francisco Bay Region, California.

Portland Cement Association, 1984, Thickness Design for Concrete Highway and Street Pavements: report.

Ritter, J.R., and Dupre, W.R., 1972, Map Showing Areas of Potential Inundation by Tsunamis in the San Francisco Bay Region, California: San Francisco Bay Region Environment and Resources Planning Study, USGS Basic Data Contribution 52, Misc. Field Studies Map MF-480.

State of California Department of Transportation, Highway Design Manual, Seventh Edition, July 1, 2020.

Working Group on California Earthquake Probabilities, 2015, The Third Uniform California Earthquake Rupture Forecast, Version 3 (UCERF), U.S. Geological Survey Open File Report 2013-1165 (CGS Special Report 228).

Yoshimine, M., Nishizaki, H., Amano, Kl, and Hosono, Y., 2006, Flow Deformation of Liquefied Sand Under Constant Shear Load and Its Application to Analysis of Flow Slide in Infinite Slope, Soil Dynamics and Earthquake Eng. 26, 253-264.

Youd, T.L. and C.T. Garris, 1995, Liquefaction-Induced Ground-Surface Disruption: Journal of Geotechnical Engineering, Vol. 121, No. 11, pp. 805 - 809.

Youd, T.L. and Idriss, I.M., et al, 1997, Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils: National Center for Earthquake Engineering Research, Technical Report NCEER - 97-0022, January 5, 6, 1996.

Youd, T. Leslie, Hansen, Corbett M., and Bartlett, Steven F., 2002, Revised Multilinear Regression Equations for Prediction of Lateral Spread Displacement: ASCE Journal of Geotechnical and Geoenvironmental Engineering, Vol. 128, December 2002, p 1007-1017.

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Vicinity Map

Flood Park Improvements
215 Bay Road
Menlo Park, CA

Project Number	1326-1-1
Figure Number	Figure 1
Date	December 2021
Drawn By	RRN

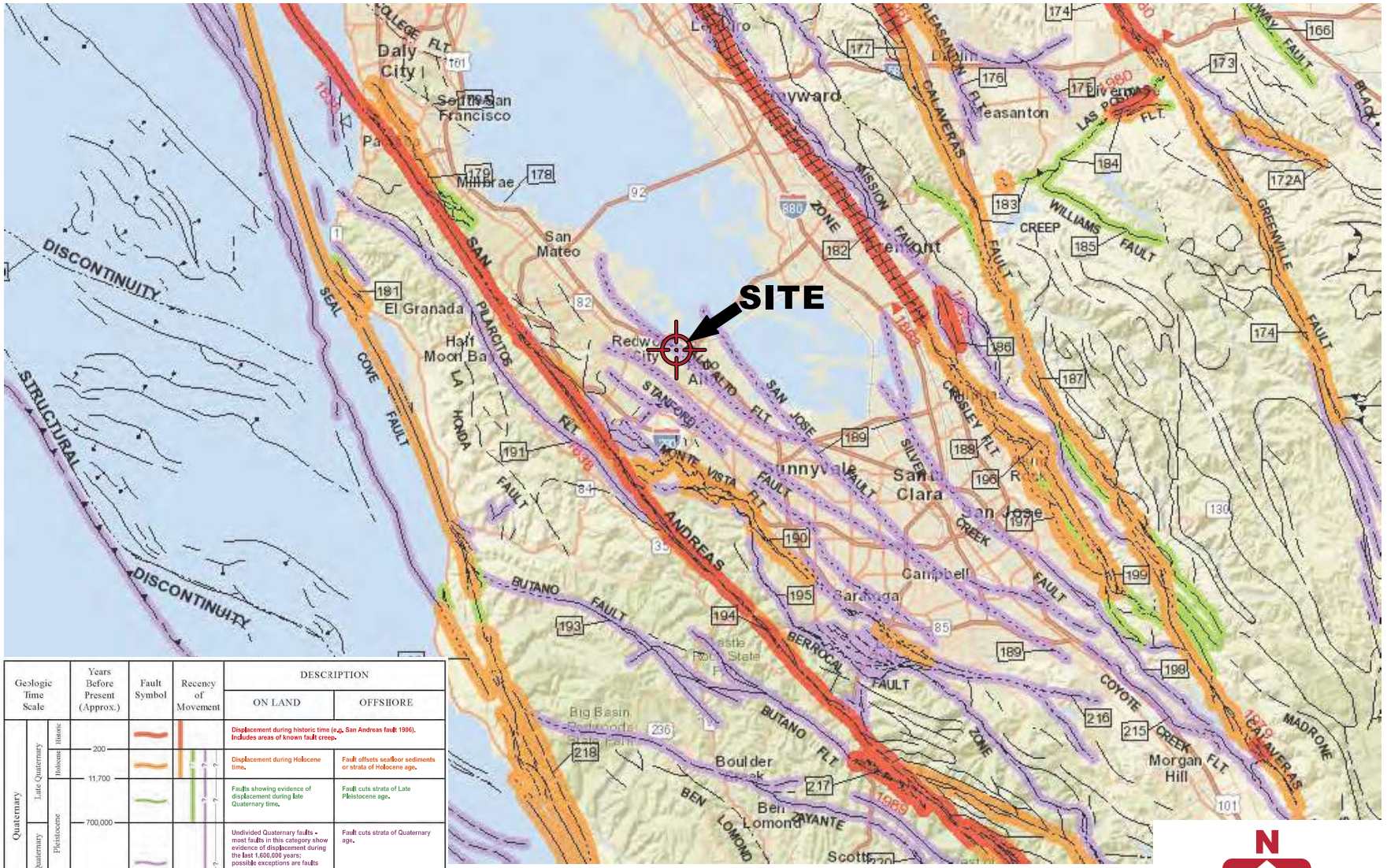
Base by Google Earth, dated 09/26/2020
Overlay by Gates + Associates, Landscape Plan, dated 2020

Project Number 1326-1-1
Figure Number Figure 2
Date December 2021
Drawn By RRN

Site Plan

Flood Park Improvements
215 Bay Road
Menlo Park, CA

CORNERSTONE EARTH GROUP



Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION	
						ON LAND	OFFSHORE
Quaternary	Late Quaternary	Historic	200			Displacement during historic time (e.g., San Andreas fault 1906). Includes areas of known fault creep.	
		Holocene	11,700			Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
	Early Quaternary	Pleistocene	700,000			Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
			1,600,000			Undivided Quaternary faults - most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	Fault cuts strata of Quaternary age.
Pre-Quaternary			4.5 billion (Age of Earth)			Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.	Fault cuts strata of Pliocene or older age.

Base by California Geological Survey - 2010 Fault Activity Map of California (Jennings and Bryant, 2010)

N

0 5 10

APPROXIMATE SCALE (MILES)

Project Number 1326-1-1

Figure Number Figure 3

Date December 2021

Drawn By RRN

Regional Fault Map

Flood Park Improvements
215 Bay Road
Menlo Park, CA

CORNERSTONE EARTH GROUP

APPENDIX A: FIELD INVESTIGATION

The field investigation consisted of a surface reconnaissance and a subsurface exploration program using track-mounted, hollow-stem auger drilling equipment. Seven 6½-inch-diameter exploratory borings were drilled on November 23 and 24, 2021 to depths of about 10 to 30 feet. The approximate locations of exploratory borings are shown on the Site Plan, Figure 2. The soils encountered were continuously logged in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D2488). Boring logs, as well as a key to the classification of the soil and bedrock, are included as part of this appendix.

Boring locations were approximated using existing site boundaries and other site features as references. Boring elevations were not determined. The locations of the borings should be considered accurate only to the degree implied by the method used.

Representative soil samples were obtained from the borings at selected depths. All samples were returned to our laboratory for evaluation and appropriate testing. The standard penetration resistance blow counts were obtained by dropping a 140-pound hammer through a 30-inch free fall. The 2-inch O.D. split-spoon sampler was driven 18 inches and the number of blows was recorded for each 6 inches of penetration (ASTM D1586). 2.5-inch I.D. samples were obtained using a Modified California Sampler driven into the soil with the 140-pound hammer previously described. Unless otherwise indicated, the blows per foot recorded on the boring log represent the accumulated number of blows required to drive the last 12 inches. The various samplers are denoted at the appropriate depth on the boring logs.

Field tests included an evaluation of the unconfined compressive strength of the soil samples using a pocket penetrometer device. The results of these tests are presented on the individual boring logs at the appropriate sample depths.

Attached boring logs and related information depict subsurface conditions at the locations indicated and on the date designated on the logs. Subsurface conditions at other locations may differ from conditions occurring at these boring locations. The passage of time may result in altered subsurface conditions due to environmental changes. In addition, any stratification lines on the logs represent the approximate boundary between soil types and the transition may be gradual.

UNIFIED SOIL CLASSIFICATION (ASTM D-2487-10)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	Cu>4 AND 1<Cc<3	GW	WELL-GRADED GRAVEL
			Cu>4 AND 1>Cc>3	GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR CL	GM	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	Cu>6 AND 1<Cc<3	SW	WELL-GRADED SAND
			Cu>6 AND 1>Cc>3	SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR CL	SM	SILTY SAND
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	PI>7 AND PLOTS>"A" LINE	CL	LEAN CLAY
			PI>4 AND PLOTS<"A" LINE	ML	SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	PI PLOTS >"A" LINE	CH	FAT CLAY
			PI PLOTS <"A" LINE	MH	ELASTIC SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT

OTHER MATERIAL SYMBOLS

- Poorly-Graded Sand with Clay
- Clayey Sand
- Sandy Silt
- Artificial/Undocumented Fill
- Poorly-Graded Gravelly Sand
- Topsoil
- Well-Graded Gravel with Clay
- Well-Graded Gravel with Silt
- Sand
- Silt
- Well Graded Gravelly Sand
- Gravelly Silt
- Asphalt
- Boulders and Cobble

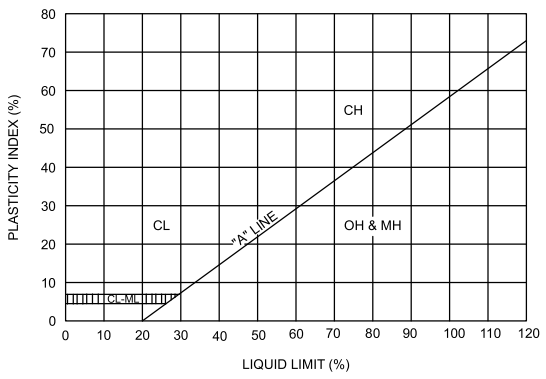
SAMPLER TYPES

- SPT
- Modified California (2.5" I.D.)
- Rock Core
- Shelby Tube
- No Recovery
- Grab Sample

ADDITIONAL TESTS

CA	-	CHEMICAL ANALYSIS (CORROSIVITY)	PI	-	PLASTICITY INDEX
CD	-	CONSOLIDATED DRAINED TRIAXIAL	SW	-	SWELL TEST
CN	-	CONSOLIDATION	TC	-	CYCLIC TRIAXIAL
CU	-	CONSOLIDATED UNDRAINED TRIAXIAL	TV	-	TORVANE SHEAR
DS	-	DIRECT SHEAR	UC	-	UNCONFINED COMPRESSION
PP	-	POCKET PENETROMETER (TSF)	(1.5)	-	(WITH SHEAR STRENGTH IN KSF)
(3.0)	-	(WITH SHEAR STRENGTH IN KSF)			
RV	-	R-VALUE	UU	-	UNCONSOLIDATED UNDRAINED TRIAXIAL
SA	-	SIEVE ANALYSIS: % PASSING #200 SIEVE			
▼	-	WATER LEVEL			

PLASTICITY CHART



PENETRATION RESISTANCE
(RECORDED AS BLOWS / FOOT)

SAND & GRAVEL		SILT & CLAY		
RELATIVE DENSITY	BLOWS/FOOT*	CONSISTENCY	BLOWS/FOOT*	STRENGTH** (KSF)
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 4	0.25 - 0.5
MEDIUM DENSE	10 - 30	MEDIUM STIFF	4 - 8	0.5-1.0
DENSE	30 - 50	STIFF	8 - 15	1.0 - 2.0
VERY DENSE	OVER 50	VERY STIFF	15 - 30	2.0 - 4.0
		HARD	OVER 30	OVER 4.0

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

** UNDRAINED SHEAR STRENGTH IN KIPS/SQ. FT. AS DETERMINED BY LABORATORY TESTING OR APPROXIMATED BY THE STANDARD PENETRATION TEST, POCKET PENETROMETER, TORVANE, OR VISUAL OBSERVATION.

CORNERSTONE EARTH GROUP

LEGEND TO SOIL DESCRIPTIONS

Figure Number A-1

BORING NUMBER EB-1

CORNERSTONE EARTH GROUP

PROJECT NAME Reimagine Flood Park
PROJECT NUMBER 1326-1-1
PROJECT LOCATION 215 Bay Road, Menlo Park, CA

DATE STARTED 11/23/21 **DATE COMPLETED** 11/23/21
GROUND ELEVATION _____ **BORING DEPTH** 10 ft.
DRILLING CONTRACTOR Cuesta Geoservices Inc.
LATITUDE 37.476376° **LONGITUDE** -122.171188°
DRILLING METHOD MPP LAD Track Rig, 6½ inch Hollow-Stem Auger
GROUND WATER LEVELS:
LOGGED BY JLC
AT TIME OF DRILLING Not Encountered
NOTES _____
AT END OF DRILLING Not Encountered

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (ft)	DEPTH (ft)	SYMBOL	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE	UNDRAINED SHEAR STRENGTH, ksf (○ HAND PENETROMETER, △ TORVANE, ● UNCONFINED COMPRESSION, ▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL; 1.0, 2.0, 3.0, 4.0)
	0		4 inches asphalt concrete							
			Sandy Lean Clay (CL) [Fill] very stiff, moist, dark brown with brown and gray mottles, fine sand, some fine subrounded to subangular gravel, low to moderate plasticity	5	MC-1B	90	19			○ 3.0
				11	MC-2B	112	16			○ 3.0
	5		**Lean Clay (CL)** very stiff, moist, gray with brown mottles, fine sand, moderate plasticity	7	MC-3B	104	11			○ 2.0
				18	MC-4B	105	19			○ 4.0
	10		Bottom of Boring at 10.0 feet.							
	15									
	20									
	25									

BORING NUMBER EB-2

CORNERSTONE EARTH GROUP

PROJECT NAME Reimagine Flood Park
PROJECT NUMBER 1326-1-1
PROJECT LOCATION 215 Bay Road, Menlo Park, CA

DATE STARTED 11/23/21 **DATE COMPLETED** 11/23/21
GROUND ELEVATION _____ **BORING DEPTH** 20 ft.
DRILLING CONTRACTOR Cuesta Geoservices Inc.
LATITUDE 37.475986° **LONGITUDE** -122.169603°
DRILLING METHOD MPP LAD Track Rig, 6½ inch Hollow-Stem Auger
GROUND WATER LEVELS:
LOGGED BY JLC
AT TIME OF DRILLING Not Encountered
NOTES _____
AT END OF DRILLING 18 ft.

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (ft)	DEPTH (ft)	SYMBOL	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE	UNDRAINED SHEAR STRENGTH, ksf (○ HAND PENETROMETER, △ TORVANE, ● UNCONFINED COMPRESSION, ▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL)
	0		6 inches sand over filter fabric							
			Sandy Lean Clay (CL) [Fill] hard, moist, dark brown, fine to coarse sand, some fine gravel, moderate plasticity	26	MC-1B	109	19			>4.5 ○
			Silty Sand (SM) [Fill] medium dense, moist, brown, fine sand	20	MC-2B	98	21	29		>4.5 ○
	5		**Lean Clay (CL)** hard, moist, dark brown, moderate plasticity Liquid Limit = 48, Plastic Limit = 19							
			Sandy Lean Clay (CL) hard, moist, brown, fine sand, low plasticity	14	MC-3B	86	13			>4.5 ○
			Lean Clay with Sand (CL) very stiff, moist, light gray with brown mottles, fine sand, moderate plasticity	14	MC-4B	98	21			2.0 ○
	10									
				17	MC-5B	105	21			2.0 ○
	15									
			becomes stiff	9	MC-6B	102	23			1.0 ○
	20		Bottom of Boring at 20.0 feet.							
	25									

BORING NUMBER EB-3

CORNERSTONE EARTH GROUP

PROJECT NAME Reimagine Flood Park
PROJECT NUMBER 1326-1-1
PROJECT LOCATION 215 Bay Road, Menlo Park, CA

DATE STARTED 11/23/21 **DATE COMPLETED** 11/23/21
GROUND ELEVATION _____ **BORING DEPTH** 30 ft.
DRILLING CONTRACTOR Cuesta Geoservices Inc.
LATITUDE 37.475381° **LONGITUDE** -122.171635°
DRILLING METHOD MPP LAD Track Rig, 6½ inch Hollow-Stem Auger
GROUND WATER LEVELS:
LOGGED BY JLC
▽ **AT TIME OF DRILLING** Not Encountered
NOTES _____
▼ **AT END OF DRILLING** 27 ft.

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (ft)	DEPTH (ft)	SYMBOL	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE	UNDRAINED SHEAR STRENGTH, ksf (○ HAND PENETROMETER, △ TORVANE, ● UNCONFINED COMPRESSION, ▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL; 1.0 2.0 3.0 4.0)
	0		3 inches topsoil							
			Sandy Lean Clay (CL) [Fill] very stiff, moist, dark brown, fine to medium sand, moderate plasticity	6	MC-1B	98	17			○
			Silty Sand (SM) [Fill] loose, moist, brown, fine sand							
			Lean Clay (CL) very stiff, moist, dark brown, some fine sand, moderate plasticity	10	MC-2B	92	13			○
	5		**Clayey Sand (SC)** medium dense, moist, brown, fine sand	20	MC-3B	98	8			
				11	MC-4B	84	12			
			Lean Clay with Sand (CL) hard, moist, brown and gray mottled, fine sand, moderate plasticity	16	MC-5B	99	19			>4.5 ○
	10									
				25	MC-6B	109	18			>4.5 ○
	15									
			becomes very stiff	14	MC-7B	104	21			○
	20									
			Lean Clay (CL) stiff, moist, brown with gray mottles, fine sand, moderate plasticity	13	MC-8B	101	22			○
	25									

Continued Next Page

BORING NUMBER EB-3

CORNERSTONE EARTH GROUP

PROJECT NAME Reimagine Flood Park

PROJECT NUMBER 1326-1-1

PROJECT LOCATION 215 Bay Road, Menlo Park, CA

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (ft)	DEPTH (ft)	SYMBOL	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE	UNDRAINED SHEAR STRENGTH, ksf (○ HAND PENETROMETER, △ TORVANE, ● UNCONFINED COMPRESSION, ▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL; 1.0 2.0 3.0 4.0)
			Lean Clay (CL) stiff, moist, brown with gray mottles, fine sand, moderate plasticity	10	MC-9B	101	22			○
	30		Bottom of Boring at 30.0 feet.							
	35									
	40									
	45									
	50									
	55									

BORING NUMBER EB-4

CORNERSTONE EARTH GROUP

PROJECT NAME Reimagine Flood Park
PROJECT NUMBER 1326-1-1
PROJECT LOCATION 215 Bay Road, Menlo Park, CA

DATE STARTED 11/24/21 **DATE COMPLETED** 11/24/21
GROUND ELEVATION _____ **BORING DEPTH** 20 ft.
DRILLING CONTRACTOR Cuesta Geoservices Inc.
LATITUDE 37.474583° **LONGITUDE** -122.170385°
DRILLING METHOD MPP LAD Track Rig, 6½ inch Hollow-Stem Auger
GROUND WATER LEVELS:
LOGGED BY JLC
▽ **AT TIME OF DRILLING** Not Encountered
NOTES _____
▼ **AT END OF DRILLING** 20 ft.

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE	UNDRAINED SHEAR STRENGTH, ksf
	0	**Lean Clay with Sand (CL)** hard, moist, dark brown, fine sand, moderate plasticity	17	MC-1B	101	14			○
			17	MC-2B	95	11			>4.5 ○
	5	**Sandy Lean Clay (CL)** hard, moist, brown, fine sand, low plasticity							
		Clayey Sand (SC) loose to medium dense, moist, brown, fine sand	15	MC-3B	96	8			
		Sandy Lean Clay (CL) hard, moist, brown and gray mottled, fine sand, low to moderate plasticity	17	MC-4B	104	17			>4.5 ○
	10								
		Lean Clay with Sand (CL) very stiff, moist, brown and gray mottled, fine sand, moderate plasticity	25	MC-5B	107	21			○
	15								
		becomes stiff	13	MC-6		30			○
	20	Bottom of Boring at 20.0 feet.							
	25								

UNDRAINED SHEAR STRENGTH, ksf
○ HAND PENETROMETER
△ TORVANE
● UNCONFINED COMPRESSION
▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL
1.0 2.0 3.0 4.0

BORING NUMBER EB-5

CORNERSTONE EARTH GROUP

PROJECT NAME Reimagine Flood Park
PROJECT NUMBER 1326-1-1
PROJECT LOCATION 215 Bay Road, Menlo Park, CA

DATE STARTED 11/24/21 **DATE COMPLETED** 11/24/21
GROUND ELEVATION _____ **BORING DEPTH** 20 ft.
DRILLING CONTRACTOR Cuesta Geoservices Inc.
LATITUDE 37.474938° **LONGITUDE** -122.172423°
DRILLING METHOD MPP LAD Track Rig, 6½ inch Hollow-Stem Auger
GROUND WATER LEVELS:
LOGGED BY JLC
▽ **AT TIME OF DRILLING** Not Encountered
NOTES _____
▼ **AT END OF DRILLING** Not Encountered

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (ft)	DEPTH (ft)	SYMBOL	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE	UNDRAINED SHEAR STRENGTH, ksf (○ HAND PENETROMETER, △ TORVANE, ● UNCONFINED COMPRESSION, ▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL; 1.0 2.0 3.0 4.0)
	0		**Lean Clay with Sand (CL) [Fill]** hard, moist, brown, fine sand, trace fine subangular gravel, moderate plasticity							
			Lean Clay with Sand (CL) hard, moist, dark brown, fine sand, moderate plasticity	10	MC-1B	99	15			>4.5 ○
			Sandy Lean Clay (CL) hard, moist, brown, fine sand, low plasticity	16	MC-2B	97	10			>4.5 ○
	5		**Clayey Sand (SC)** medium dense, moist, brown, fine sand, some fine subangular to subrounded gravel	21	MC-3B	99	6			
				19	SPT-4		6		39	
			Lean Clay with Sand (CL) hard, moist, brown with gray mottleds, fine sand, moderate plasticity	18	MC-5B	92	21			>4.5 ○
	10									
			color changes to gray with light gray mottles	20	MC-6B	104	19			>4.5 ○
	15		**Sandy Lean Clay (CL)** very stiff, moist, gray with brown mottles, fine to medium sand, some fine subrounded gravel, low plasticity	18	MC-7B	116	16			○
	20		Bottom of Boring at 20.0 feet.							
	25									

BORING NUMBER EB-6

CORNERSTONE EARTH GROUP

PROJECT NAME Reimagine Flood Park
PROJECT NUMBER 1326-1-1
PROJECT LOCATION 215 Bay Road, Menlo Park, CA

DATE STARTED 11/23/21 **DATE COMPLETED** 11/23/21
GROUND ELEVATION _____ **BORING DEPTH** 10 ft.
DRILLING CONTRACTOR Cuesta Geoservices Inc.
LATITUDE 37.475236° **LONGITUDE** -122.173480°
DRILLING METHOD MPP LAD Track Rig, 6½ inch Hollow-Stem Auger
GROUND WATER LEVELS:
LOGGED BY JLC
AT TIME OF DRILLING Not Encountered
NOTES _____
AT END OF DRILLING Not Encountered

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (ft)	DEPTH (ft)	SYMBOL	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE	UNDRAINED SHEAR STRENGTH, ksf (○ HAND PENETROMETER, △ TORVANE, ● UNCONFINED COMPRESSION, ▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL; 1.0 2.0 3.0 4.0)
	0		**Lean Clay with Sand (CL)** hard, moist, dark brown to brown, fine sand, moderate plasticity Liquid Limit = 42, Plastic Limit = 17	25	MC-1B	103	14	25		>4.5 ○
				18	MC-2B	92	13			○
	5		**Clayey Sand (SC)** medium dense to loose, moist, light brown, fine sand	21	MC-3B	103	6		35	
				11	MC-4B	92	10			
			Lean Clay with Sand (CL) hard, moist, gray with brown mottles, fine sand, moderate plasticity	20	MC-5B	91	22			>4.5 ○
	10		Bottom of Boring at 10.0 feet.							
	15									
	20									
	25									

BORING NUMBER EB-7

CORNERSTONE EARTH GROUP

PROJECT NAME Reimagine Flood Park
PROJECT NUMBER 1326-1-1
PROJECT LOCATION 215 Bay Road, Menlo Park, CA

DATE STARTED 11/24/21 **DATE COMPLETED** 11/24/21
GROUND ELEVATION _____ **BORING DEPTH** 10 ft.
DRILLING CONTRACTOR Cuesta Geoservices Inc.
LATITUDE 37.473791° **LONGITUDE** -122.170307°
DRILLING METHOD MPP LAD Track Rig, 6½ inch Hollow-Stem Auger
GROUND WATER LEVELS:
LOGGED BY JLC
▽ **AT TIME OF DRILLING** Not Encountered
NOTES _____
▼ **AT END OF DRILLING** Not Encountered

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (ft)	DEPTH (ft)	SYMBOL	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE	UNDRAINED SHEAR STRENGTH, ksf (○ HAND PENETROMETER, △ TORVANE, ● UNCONFINED COMPRESSION, ▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL; 1.0 2.0 3.0 4.0)
	0		6 inches concrete rubble							
			Lean Clay with Sand (CL) hard, moist, dark brown to brown, fine sand, moderate plasticity	15	MC-1B	91	14			>4.5 ○
				23	MC-2B	97	15			
	5		**Clayey Sand (SC)** medium dense, moist, light brown, fine sand, trace organics	20	MC-3B	96	10			>4.5 ○
			Sandy Lean Clay (CL) hard, moist, brown and gray mottled, fine to medium sand, low plasticity	19	MC-4B	102	13			>4.5 ○
	10		Bottom of Boring at 10.0 feet.							
	15									
	20									
	25									

APPENDIX B: LABORATORY TEST PROGRAM

The laboratory testing program was performed to evaluate the physical and mechanical properties of the soils retrieved from the site to aid in verifying soil classification.

Moisture Content: The natural water content was determined (ASTM D2216) on 41 samples of the materials recovered from the borings. These water contents are recorded on the boring logs at the appropriate sample depths.

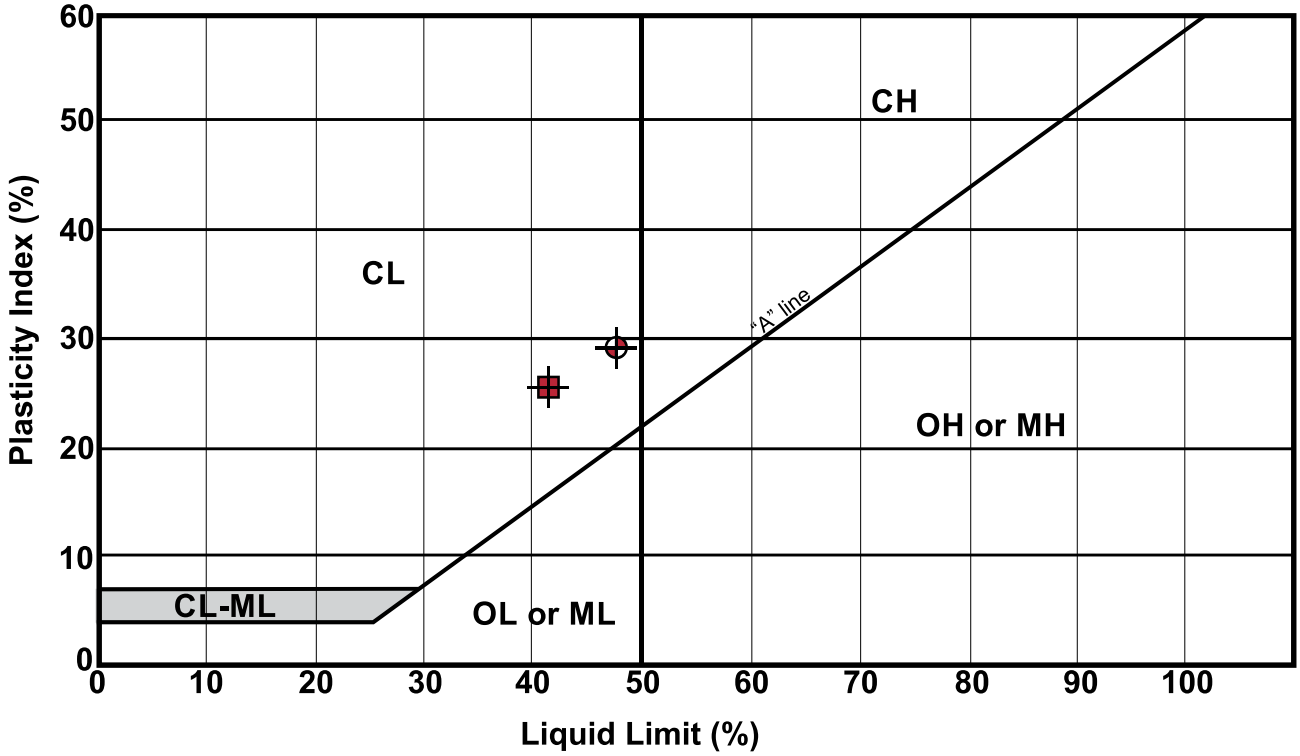
Dry Densities: In place dry density determinations (ASTM D2937) were performed on 40 samples to measure the unit weight of the subsurface soils. Results of these tests are shown on the boring logs at the appropriate sample depths.

Washed Sieve Analyses: The percent soil fraction passing the No. 200 sieve (ASTM D1140) was determined on two samples of the subsurface soils to aid in the classification of these soils. Results of these tests are shown on the boring logs at the appropriate sample depths.

Plasticity Index: Two Plasticity Index determinations (ASTM D4318) were performed on samples of the subsurface soils to measure the range of water contents over which this material exhibits plasticity. The Plasticity Index was used to classify the soil in accordance with the Unified Soil Classification System and to evaluate the soil expansion potential. Results of these tests are shown on the boring logs at the appropriate sample depths.

Corrosion: Soluble sulfate determinations (ASTM D4327), resistivity tests (ASTM G57), chloride determinations (ASTM D4327), and pH determinations (ASTM G51) were performed on three representative samples of the subsurface soils. Results of these tests are attached to this appendix.

Plasticity Index (ASTM D4318) Testing Summary



Symbol	Boring No.	Depth (ft)	Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	Passing No. 200 (%)	Group Name (USCS - ASTM D2487)
⊕	EB-2	4.0	21	48	19	29	—	Lean Clay (CL)
⊞	EB-6	2.0	14	42	17	25	—	Lean Clay with Sand (CL)

Samples prepared in accordance with ASTM D421

CORNERSTONE EARTH GROUP

Plasticity Index Testing Summary

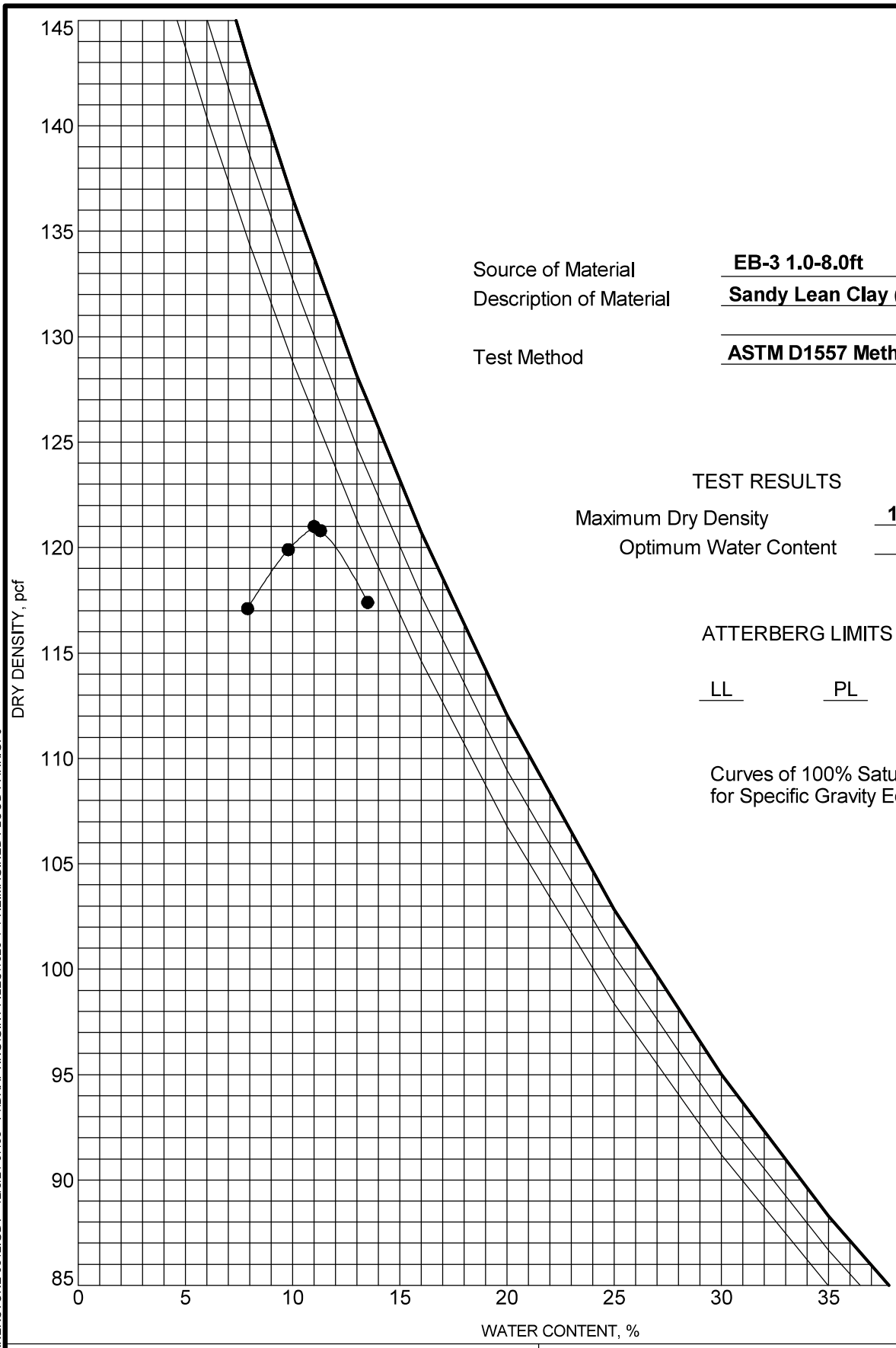
Flood Park Improvements
215 Bay Road
Menlo Park, CA

Project Number: 1326-1-1

Figure Number: Figure B1

Date: December 2021

Drawn By: FLL



Source of Material: **EB-3 1.0-8.0ft**

Description of Material: **Sandy Lean Clay (CL)**

Test Method: **ASTM D1557 Method C**

TEST RESULTS

Maximum Dry Density: **121.0 PCF**

Optimum Water Content: **11.0 %**

ATTERBERG LIMITS

LL	PL	PI

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

CORNERSTONE EARTH GROUP

MOISTURE-DENSITY RELATIONSHIP

Project: Reimagine Flood Park

Location: 215 Bay Road, Menlo Park, CA

Number: 1326-1-1

US_COMPACTION - CORNERSTONE 0812.GDT - 12/6/21 07:38 - P:\DRAFTING\GINT FILES\1326-1-1 REIMAGINED FLOOD PARK.GPJ

Corrosivity Tests Summary

CORNERSTONE EARTH GROUP

Job Number	1326-1-1	Date Tested	12/8/2021
Job Name	Flood Park Improvements	Tested By	BBA, FL
Location	215 Bay Road, Menlo Park, CA		

Sample I.D.			Soil Visual Description	Moisture Content	pH	Temp. at Testing	Resistivity (Ohm-cm)		Chloride	Sulfate
							Corrected to 15.5 C°		Dry Wt.	Dry Wt.
Boring	Sample No.	Depth, ft.		%		C°	As Received	Saturated	mg/kg	mg/kg
				ASTM D2216	ASTM G51		G57	ASTM G57	ASTM D4327	ASTM D4327
EB-1	3A	5.5	Brown Sandy Lean Clay (CL) [Fill]	10.5	7.1	22.1	-	2,773	3	17
EB-2	2A	3.5	Dark Brown Lean Clay (CL)	21.1	6.4	23.9	-	893	15	343
EB-4	1A	1.5	Dark Brown Lean Clay with Sand (CL)	14.2	6.4	23.9	-	1,163	4	15
RB-7	2A	3.5	Brown Lean Clay with Sand (CL)	14.9	6.3	24.1	-	1,397	3	42

APPENDIX C: SITE CORROSIVITY EVALUATION

JDH CORROSION CONSULTANTS REPORT DATED DECEMBER 9, 2021

December 9, 2021

Cornerstone Earth Group, Inc.
1259 Oakmead Parkway
Sunnyvale, CA 94085

Attention: **Jennifer Campbell, P.E.**
Senior Staff Engineer

Subject: **Site Corrosivity Evaluation**
Flood Park
Menlo Park, CA
Project: 1326-1-1

Dear Jennifer,

In accordance with your request, we have reviewed the laboratory soils data for the above referenced project site. Our evaluation of these results and our corresponding recommendations for corrosion control for the above referenced project foundations and buried site utilities are presented herein for your consideration.

Soil Testing & Analysis

Soil Chemical Analysis

Four (4) soil samples from the project site were chemically analyzed for corrosivity by **Cornerstone Earth Group**. Each sample was analyzed for chloride and sulfate concentration, pH, resistivity at 100% saturation and moisture percentage. The test results are presented in Cornerstone Earth Group Corrosivity Test Summary dated 12/8/2021. The results of the chemical analysis were as follows:

Soil Laboratory Analysis

Chemical Analysis	Range of Results	Corrosion Classification*
Chlorides	3 – 15 mg/kg	Non-corrosive*
Sulfates	15 – 343 mg/kg	Non-corrosive to Mildly Corrosive**
pH	6.3 – 7.1	Mildly Corrosive to Non-corrosive*
Moisture (%)	10.5 – 21.1 %	Not-applicable
Resistivity at 100% Saturation	893 – 2,773 ohm-cm	**Corrosive to Moderately Corrosive***

* With respect to bare steel or ductile iron.
** With respect to mortar coated steel

Discussion

Reinforced Concrete Foundations

Due to the low levels of water-soluble sulfates found in these soils, there is no special requirement for sulfate resistant concrete to be used at this site. The type of cement used should be in accordance with California Building Code (CBC) for soils which have less than 0.10 percent by weight of water soluble sulfate (SO_4) in soil and the minimum depth of cover for the reinforcing steel should be as specified in CBC as well.

Underground Metallic Pipelines

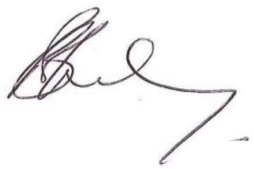
The soils at the project site are generally considered to be "corrosive" to ductile/cast iron, steel and dielectric coated steel based on the saturated resistivity measurements. Therefore, special requirements for corrosion control are required for buried metallic utilities at this site depending upon the critical nature of the piping. Pressure piping systems such as domestic and fire water should be provided with appropriate coating systems and cathodic protection, where warranted. In addition, all underground pipelines should be electrically isolated from above grade structures, reinforced concrete structures and copper lines in order to avoid potential galvanic corrosion problems.

LIMITATIONS

The conclusions and recommendations contained in this report are based on the information and assumptions referenced herein. All services provided herein were performed by persons who are experienced and skilled in providing these types of services and in accordance with the standards of workmanship in this profession. No other warrantees or guarantees, expressed or implied, is provided.

We thank you for the opportunity to be of service to **Cornerstone Earth Group** on this project and trust that you find the enclosed information satisfactory. If you have any questions, or if we can be of any additional assistance, please feel free to contact us at (925) 927-6630.

Respectfully submitted,



Brendon Hurley
JDH CORROSION CONSULTANTS, INC.
Field Technician

Mohammed Ali., P.E.
JDH Corrosion Consultants, Inc.
Senior Corrosion Engineer

CC: File2021422

CORNERSTONE EARTH GROUP

Date:	May 24, 2023
Project No.:	1326-1-3
Prepared For:	Mr. Chris Gulliard **CMG LANDSCAPE ARCHITECTURE** 444 Bryant Street San Francisco, California
Re:	Supplemental Recommendations for Synthetic Turf Field Reimagine Flood Park 215 Bay Road Menlo Park, California

Dear Mr. Gulliard:

As requested, this letter presents the supplemental recommendations to the above project. We have prepared a geotechnical report titled "Reimagine Flood Park, 215 Bay Road, Menlo Park, California" dated June 27, 2022. The June 2022 report should be referred to for information not contained in this letter.

Project Description

Based on our understanding of the synthetic turf field design, the synthetic turf system will include 7 inches of Class 2 permeable base beneath the synthetic turf and shock pad. A 12-inch wide prefabricated Hydraway field drainage mat spaced 20 feet on center will be placed at the bottom of the Class 2 permeable rock and connect to a perimeter drainage trench. The perimeter drainage trench will consist of Number 57 rock lined with Mirafi 140N.

We understand the Class 2 permeable base and perimeter drainage trench are being used for retention calculations. The system is designed to handle a 10-year, 1-hour storm, assuming no infiltration during that 1-hour event. After the event, the water would slowly infiltrate at the perimeter drainage trench. Any water in excess of that treatment capacity, is expected to overland release onto surrounding landscape areas, and then infiltrate. We understand the existing storm drain system is very shallow, hence the design team is taking the above approach.

Supplemental Earthwork Recommendations

We are providing supplement earthwork recommendations to those we have already provided in our report to help provide some additional guidance for the synthetic turf field.

Subgrade Preparation

After stripping, we anticipate that the exposed subgrade soil will be very stiff to hard high plasticity clay. From a geotechnical viewpoint, these materials will expand and contract due to natural moisture fluctuations and will become unstable during the wet season of the year.

To mitigate the issues with the expansive clays, we recommend that the soils be treated to a depth of 12 inches below the subgrade level. On a preliminary basis for budgeting purposes, a 4 percent lime based on a dry unit weight of the soil of about 100 pounds per cubic foot can be used. The actual percentage of lime should be based on a lime stability test performed on the field subgrade soil. The soil/lime mixture should be compacted to at least 90 percent maximum dry density as determined by ASTM D1557, latest edition. The lime treatment should be performed in accordance with the Guide Specifications attached to this letter. Our representative should be on-site to observe and test soil/lime mixing operations and compaction. Representative field density tests should be performed to verify that the contractor has compacted the soil/lime to the project specifications.

Recommendations for Testing and Acceptance of Permeable Base

Prior to import of the Class II Permeable Aggregate Base, we would recommend a gradation test be performed on a representative sample (taken from the source) to verify that it meets the grading requirement as outlined in Section 68 of the Caltrans Standard Specifications. Additionally, we recommend that periodic gradation tests be performed on samples of the Class II Permeable Aggregate base that is imported (i.e. delivered) to the job site to confirm the material that has been delivered meets the grading requirements. The frequency of the sampling for graduation testing would be to sample every 500 tons of Class II permeable base. Any material that does not meet the gradation requirements should be removed and replaced at no additional cost to the client.

Over-Compaction of Class II Permeable Base

Recommendations for compaction and placement of the Class II permeable aggregate base are provided in Table 3, Section 6.8, Compaction Requirements of our report. The base should be consolidated in place to 92 percent relative compaction (do not over compact).

The Class II Permeable base should be placed under the observation of the Geotechnical Engineer's representative. Our experience is that higher relative compaction and compaction effort will reduce the infiltration rate of the permeable base material which reduces drainage of the surface water. If during construction observation the field density testing indicates a higher relative compaction, we recommend that at least 10 infiltration tests be performed on the field in accordance with ASTM F2898 to confirm the base has an infiltration rate that meets project specifications. If heavy trucks are allowed to make repeated trips across the permeable rock surface, the surface should be re-scarified and lightly rolled before infiltration testing is performed. If the material becomes mishandled, segregated, or broken down and not suitable for its intended purpose in the opinion of the designer or geotechnical engineer, it should be removed and replaced at no additional cost to the client.

Infiltration Testing of Class II Permeable Base

Based on our experience and previous review of literature from turf manufacturer, we understand that the target infiltration rate of no less than 10 inch per hour(in/hr) is needed for a well-draining field. Testing performed in the past by our firm has confirmed measured infiltration rates of 10 inch per hour(in/hr) to 20 inch per hour(in/hr) on similar projects with base material that meets the gradation requirements of Class II Permeable Base material.

To confirm that Class II Permeable Base materials meet the target infiltration rate, we recommend we be retained to perform field infiltration tests in general accordance with ASTM F2898 titled “Standard Test Method for Permeability of Synthetic Turf Sports Field Base Stone and Surface System by Nonconfined Area Flood Test Method.”

The test method involves presoaking the test areas with 50 gallons of water followed by running a 25-gallon test to estimate the area of saturation and time for the water to soak into the base material. Following the tests, estimates of the infiltration rate of the tested areas are made using the data from the tests and reported to the project team for review and evaluation. We recommend that at least 5 infiltration tests be performed before placing the synthetic turf carpet.

Construction Moisture Conditioning

Expansive soils can undergo significant volume change when dried then wetted. The contractor should keep all exposed expansive soil subgrade (and also trench excavation side walls) moist until protected by overlying improvements (or trenches are backfilled). If expansive soils are allowed to dry out significantly, re-moisture conditioning may require several days of re-wetting (flooding is not recommended), or deep scarification, moisture conditioning, and re-compaction.

Perimeter Drainage Trench Recommendations

We understand the perimeter drainage trench will be approximately 3 feet deep. To reduce the potential for moisture fluctuation in the trench that extends beneath the lime treated section, we recommend a 10-mil visqueen along the sidewalls and extend a minimum of 8 to 12 inches into the trench bottom.

Please note our previous infiltration testing was competed at locations outside of the planned field footprint. We understand BKF Engineers, is recommending infiltration testing during construction of the perimeter drainage trench to confirm the infiltration calculations. We recommend a minimum of one infiltration test along each side of the field however, this could increase based on field conditions and BKF review.

Plans, Specifications, and Construction Review

Because subsurface conditions may vary considerably from previously drilled, relatively small diameter borings, and in order to check that our recommendations have been properly implemented, we recommend that our firm be retained to 1) review the final construction plans and specifications and 2) observe the earthwork and foundation instillation. Also, the assumed and/or actual geotechnical conditions can be greatly affected by the construction process. For the above reasons, our geotechnical recommendations are contingent upon our firm providing the geotechnical observation and testing services during construction.

Closure

We hope this provides the information you need at this time. Recommendations presented in this letter have been prepared for the sole use of CMG Landscape Architecture specifically for the property at 215 Bay Raod, Menlo Park, California. Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with

generally accepted geotechnical engineering principles and practices at this time and location. No warranties are either expressed or implied.

If you have any questions or need any additional information from us, please call and we will be glad to discuss them with you.

Sincerely,

Cornerstone Earth Group, Inc.

Erin L. Steiner, P.E., G.E.
Senior Principal Engineer

DL:ELS

Copies: Addressee (PDF by email)

Attachments: Guide Specification for Lime Treatment

QUALITY CONTROL AND CONSTRUCTION SPECIFICATIONS
for
High-Calcium Quicklime

1.01 Description

This work consists of mixing in-place soil with dry quicklime and water; then spread, mix, and compact the mixture to the lines, grades and dimensions shown on the plans and as specified in these specifications or special provisions.

1.02 Materials

In-place material shall not contain rocks or solids other than soil clods larger than 3 inches in any dimension. Removing and disposing of said rocks or solids larger than 3 inches will be paid for as extra work.

Quicklime – Quicklime shall be ASTM Designation: C 977 (Specification for Quicklime and Hydrated Lime for Soil Stabilization). Sampling shall conform to ASTM C 50. The Quicklime shall be protected from moisture until used and be sufficiently dry to flow freely when handled. Quicklime shall be furnished in bulk with product certification on the certified weigh tags

When dry sieved in a mechanical sieve shaker for 10 minutes +/- 30 seconds a 250-gram test sample of Quicklime shall conform to the following grading requirements:

Sieve Size	Percentage Passing
3/8	98 - 100

Water shall be clean and potable and shall be added as needed during mixing and re-mixing operations, during compacting, and during the curing period.

1.03 Proportioning / Spreading

The Quicklime shall be spread in one operation to the required width, grade and cross section. Quicklime shall be evenly spread at the designated rate and shall not vary more than 5 percent on any area. Only a calibrated spreader able to provide a uniform distribution of the Quicklime throughout the treatment area shall spread the Quicklime. The Quicklime shall be added in a dry state and every precaution shall be taken to prevent dusting.

Tailgate spreading of the Quicklime will not be permitted. Tailgating is defined as having manual control of the spread rate, instead of automatic. The spreader truck shall demonstrate the ability to maintain a consistent spread rate over variable travel speeds.

The contractor will demonstrate the consistency of the spread rate by conducting a multiple pan tests. The test is 3 pans in a row with readings in tolerance.

No traffic other than the mixing equipment or other related construction equipment will be allowed to pass over the spread Quicklime until after completion of mixing.

1.04 Initial Mixing

Mixing equipment shall be equipped with a visible depth indicator showing mixing depth, an odometer to indicate travel speed and a controllable water additive system for regulating water added to the mixture. The initial mix shall be done while introducing water (to provide moisture content about 5 percent above optimum) through a controllable pump on the mixing machine. Spread lime shall not be left exposed for more than 6 hours.

Mixing equipment shall be the type that can mix to the full depth of the desired thickness and leave a relatively smooth bottom of the treated section. Mixing and re-mixing, regardless of equipment used, will continue until the material is uniformly mixed, free of streaks or pockets of unhydrated Quicklime and clay clods are broken down to less than 1-inch in size. Two or more passes (1 pass = 1 coverage) with the mixer should be anticipated during initial mixing to achieve breakdown. Moisture content shall be more than **3 percent** over the treated soils design optimum after the initial mixing.

Treated material shall not be mixed or spread while the atmospheric or soil temperature is below 35 F or below 1.67 C.

1.05 Mellowing and Re-Mixing

After initial mixing and hydration, the treated material shall mellow for a minimum of 36 hours prior to re-mixing or until the soil becomes friable. Once the mellowing period has been completed, the treated soil shall be re-mix and re-hydrated to the full depth of treatment.

All material other than rock or aggregate complies with the following requirements:

Sieve size	Percent Passing
1"	100 Min.
#4	60 Min.

No color reaction of the treated material, exclusive of one inch or larger clods, is tested with the standard phenolphthalein alcohol indicator, will be considered evidence of inadequate mixing.

1.06 Compacting

The Quicklime treated soils shall be compacted to a minimum of 90 percent relative compaction determined by ASTM 1557.

The maximum compacted thickness of a single layer may be any thickness the contractor can demonstrate to the Engineer that his equipment and method of operation will provide the required compacted density throughout the layer.

Initial compaction shall be performed by means of open ring sheepsfoot type compactor. Final rolling shall be by means of steel - drum or pneumatic - tired rollers. Areas inaccessible to rollers shall be compacted to the required compaction by other means satisfactory to the Engineer.

1.07 Finishing and Curing

After the final layer or course of lime-treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The contractor shall finish grade the compacted lime treated subgrade within 24 to 48 hours of the final compaction of the lime treated section. The contractor shall not use the finished subgrade as a "haul road" or other similar use and shall keep heavy construction equipment off the finished subgrade until the Aggregate Base is placed and compacted. The completed section shall then be finished by rolling, as directed by the Engineer, with a pneumatic or other suitable roller sufficiently light to prevent hairline cracking. The finished surface shall not vary more than 3/8 inch (9 mm) when tested with a 12 feet (3.7 m) straightedge applied parallel with and at right angles to the pavement centerline. Any variations in excess of this tolerance shall be corrected by the Contractor in a manner satisfactory to the Engineer, and the cost shall be incidental to this item.

The contractor shall periodically (1 to 3 times) daily water the top of the subgrade to reduce the potential for drying out the lime treated subgrade during the curing period until the baserock is placed.

The completed lime treated section shall be moist-cured for a minimum of seven (7) days before further courses are added or any traffic is permitted, unless otherwise directed by the Engineer.

1.08 Maintenance

The Contractor shall protect and maintain the lime-treated subgrade from yielding until the lime-treated subgrade is covered by placement of the next layer. The cost of this maintenance shall be incidental to this item.

1.09 Handling and safety

The Contractor shall obtain and enforce the lime supplier's instructions for proper safety and handling of the lime to prevent physical eye or skin contact with lime during transport or application.

1.10 Payment

Lime-treated subgrade shall be paid for by the square yard (square meter) in the completed and accepted work.

Attachment A-1

Equipment and Vehicle Load Restrictions
On City and County of San Francisco (City) Pipeline Right-Of-Way

To prevent damage to City's underground pipelines, Permittee's use of vehicles and equipment within twenty feet (20') of each side of the centerline of City's pipelines (measured on the surface) shall be subject to the following restrictions:

(i) The depth of soil cover the tops of City's pipelines must be at least three feet (3') for steel cylinder pipe and four feet (4') for reinforced pre-stressed concrete cylinder pipe to accommodate the loading as defined below in item (ii). If any equipment or vehicle with axle loading exceeds the loads stated in item (ii) below or if the depth of the soil cover is less than stated above, Permittee shall submit to City's Public Utilities Commission, Water Supply and Treatment Division (SFPUC) for review and approval, in SFPUC's sole discretion, engineering calculations prepared by a licensed Professional Engineer showing that City's pipelines will not be adversely affected by Permittee's proposed activities. In the event that City's pipelines may be adversely affected, Permittee shall submit remedial measures for City's approval to ensure that no adverse effect will occur.

(ii) The effects of vehicle and equipment loads to the pipe must not exceed the effects of the "AASHTO Standard H-10 Loading." H-10 loading is defined as loading caused by a two-axle truck with a gross weight of ten tons (20,000 lbs.), axles fourteen feet (14') apart, and rear axle carrying 8-tons (16,000 lbs.). Permittee shall be responsible to provide SFPUC adequate evidence that its equipment and vehicles meet the foregoing requirements.

(iii) Permittee shall not use vibrating compaction equipment without SFPUC's prior written approval, which approval may be withheld in SFPUC's sole discretion.

(iv) If the depth of the soil cover over the pipeline (determined by potholing or other proven procedure) is less than the minimum stated in (i) above, unless an alternate method is approved by SFPUC in writing, all excavation and grading over the pipeline shall be performed manually. For any machinery equipment excavation and grading over and within twenty feet (20') on each side of the centerline of the pipeline (measured on the surface), Permittee shall submit a written proposal together with all supporting calculations and data to SFPUC for review and approval. In any case, the two feet (2') of soil around the pipeline shall be removed manually or by other methods approved by SFPUC.

Mitigation Monitoring and Reporting Program

This Mitigation Monitoring and Reporting Program (MMRP) was formulated based upon the findings of the Original Environmental Impact Report (EIR) and the Final Revised EIR prepared for the Flood County Park Landscape Plan. The MMRP, which is provided in the following table, lists mitigation measures required and recommended in the Original and Revised EIRs for the proposed plan and identifies mitigation monitoring requirements. The Final MMRP must be adopted when the County makes a final decision on the Landscape Plan.

This MMRP has been prepared to comply with the requirements of State law (Public Resources Code Section 21081.6). State law requires the adoption of an MMRP when mitigation measures are required to avoid significant impacts. The MMRP is intended to ensure compliance during implementation of the project.

The MMRP is organized in a matrix format. The first column identifies mitigation measures that were identified in the Final EIR. The second column, entitled “Action Required,” refers to the monitoring action that must be taken to ensure the mitigation measure’s implementation. The third column, entitled “Monitoring Timing,” refers to when the monitoring will occur to ensure that the mitigation action is complete. The fourth column, “Responsible Agency,” refers to the agency responsible for oversight or ensuring that the mitigation measure is implemented. The “Compliance Verification” column is where the Responsible Agency verifies that the measures have been implemented. These mitigation measures include any minor revisions made as a result of the Response to Comments Document.

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Responsible Agency	Compliance Verification		
				Initial	Date	Comments
AESTHETICS						
AES-1: Athletic Netting Color						
If the County installs athletic netting around the proposed soccer/lacrosse field or the multi-use ballfield/soccer/lacrosse field, this netting shall have a neutral color (e.g., forest green, black, gray) that blends in with the natural environment at Flood County Park.	Review and approve the netting plans for athletic fields.	Prior to construction of athletic fields with netting	County of San Mateo Parks Department			
AIR QUALITY						
AQ-2: Recommended Basic Construction Mitigation Measures						
Although no mitigation is required, BAAQMD recommends that all projects implement the following Basic Construction Mitigation Measures to meet the best management practices threshold for fugitive dust (BAAQMD 2017a): ▪ All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. ▪ All haul trucks transporting soil, sand, or other loose material off-site shall be covered. ▪ All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. ▪ All vehicle speeds on unpaved roads shall be limited to 15 mph. ▪ All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. ▪ Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of	Ensure that construction contractors comply with the Bay Area Air Quality Management District's recommended Basic Construction Mitigation Measures.	During construction	County of San Mateo Parks Department			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Responsible Agency	Compliance Verification		
				Initial	Date	Comments
California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. ▪ All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified visible emissions evaluator. ▪ Post a publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations. In addition, the following BAAQMD measure suggested is recommended to reduce NO_x emissions from off-road equipment because these emissions would be near the threshold of 54 pounds per day (BAAQMD 2017a): ▪ The project shall develop a plan demonstrating that the off-road equipment (more than 50 horsepower) to be used in the construction project (i.e., owned, leased, and subcontractor vehicles) would achieve a project wide fleet-average 20 percent NO_x reduction and 45 percent PM reduction compared to the most recent ARB fleet average. Acceptable options for reducing emissions include the use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, add-on devices such as particulate filters, and/or other options as such become available.						
BIOLOGICAL RESOURCES						
BIO-1(a): Bird Protection Measures						
This mitigation measure shall apply to all proposed Phase I, II, and III recreational elements. a. If possible, trees and shrubs that would be impacted by construction activities shall be removed during the non-nesting season (typically between September 1 and January 31).	Either remove tree and shrubs during non-nesting season or retain biologist for survey during nesting season;	Prior to removal or pruning of trees and shrubs	County of San Mateo Parks Department			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Responsible Agency	Compliance Verification		
				Initial	Date	Comments
b. If trees and shrubs are removed during the nesting season (February 1 to August 31), all suitable nesting habitat within the limits of work shall be surveyed by a qualified biologist prior to initiating construction-related activities. A pre-construction survey shall be conducted within five days prior to the start of work. If no nests are observed, construction activities shall be initiated within five days. If more than five days pass and construction has not been initiated, another survey will be required. c. If, during the nesting season, an active nest is discovered in trees or shrubs to be removed, the vegetation shall be protected using orange construction fence or the equivalent. The protective fencing shall be placed around the vegetation at the following distance(s) depending on species and upon recommendation from a qualified biologist: 100-250 feet from the drip line of the vegetation for passerines and non-raptors; and 300-500 feet from the drip line of the vegetation for raptors. No parking, storage of materials, or work would be allowed within this area until the end of the nesting season or until the young have fledged, as determined by a qualified biologist.	Verified adherence to bird protection measures if necessary	During ground-disturbing activities if necessary				
BIO-1(b): Bat Protection Measures						
This mitigation measure shall apply to construction under the Landscape Plan that involves tree removal. a. A qualified biologist shall conduct a pre-construction survey for roosting bats at least two weeks prior to, but not more than 30 days prior to, the start of construction. The pallid bat could potentially roost in hollow trees. The survey shall be conducted within 200 feet of all planned construction activities within two weeks prior to any removal of trees (particularly trees 12 inches in diameter or greater at 4.5 feet above grade with loose bark or other cavities). b. A buffer zone of 100 feet that excludes construction activities or other disturbances shall be established around active bat roosts.	Retain biologist for pre-construction survey; Verified adherence to bat protection measures if necessary	Prior to tree removal; During tree removal if necessary	County of San Mateo Parks Department			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Responsible Agency	Compliance Verification		
				Initial	Date	Comments
c. If active maternity roosts or non-breeding bat hibernacula are found in trees scheduled to be removed, relocation or other measures shall be determined in consultation with the County of San Mateo and/or CDFW, as appropriate, and a qualified biologist.						
BIO-2(a): Tree Replacement						
The County shall replace County-defined significant trees that are removed from Flood County Park at 1:1 ratio. Suitable replacement trees shall be similar species deemed suitable by the Planning Director.	Verify that landscaping plans include replacement of removed significant trees with suitable trees at 1:1 ratio	During review of landscaping plans	County of San Mateo Planning and Building Department			
BIO-2(b): Tree Avoidance and Minimization Measures						
The following measures to avoid and protect trees shall apply to individual recreational elements of all proposed Phase I, II, and III improvements: a. The County shall monitor significant trees with CRZs impacted by construction activities (canopies and roots) during construction for signs of distress. The CRZ is defined as the area of soil around a tree trunk where roots are located that provide stability and uptake of water and minerals required for tree survival by the ISA's Best Management Practices – Managing Trees During Construction handbook. b. Excavation/Trenching shall avoid CRZs to the greatest extent feasible. The following measures shall be applied when excavation and trenching occurs near significant trees: • Where appropriate tunneling shall be used to preserve roots two inches in diameter, and wherever possible underground lines shall occupy common trenches. • When root cutting occurs, exposed major roots (greater than two inches in diameter or within five feet of the trunk) shall not be ripped by construction equipment. Roots shall be cleanly cut and made at right angles to the roots. • A Certified Arborist shall be present if more than 30 percent of the root zone is impacted or roots greater	Verify adherence to avoidance and minimization measures for significant trees with CRZs impacted by construction activities.	Periodically during construction	County of San Mateo Parks Department			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Responsible Agency	Compliance Verification		
				Initial	Date	Comments
than two inches or within five feet of the trunk will be cut, to document impacts to the CRZ. • Absorbent tarp or heavy cloth fabric shall cover new grade cuts and be overlain by compost or woodchip mulch. c. The County shall stage construction equipment outside of the CRZs and apply precautions, such as steel traffic plates and fencing, to protect sensitive root zones. d. The County shall install protective fencing around significant trees prior to any earthwork and remain until all work is complete, or until adjacent construction activity no longer threatens tree health. Fencing shall be six foot high chain link fencing (or comparable material) and installed at the outermost edge of the CRZ, or eight feet from the trunk of the significant tree, whichever is greatest. Signs stating "Tree Protection Zone – Keep Out" shall be posted on the fence. e. Pruning for clearance, if needed, shall be done to prevent damage to branches with large equipment. All above-ground pruning shall be in accordance with the Tree Pruning Guidelines (International Society of Arboriculture) and/or the ANSI A300 Pruning Standard (American National Standard for Tree Care Operations) and adhere to the most recent edition of ANSI Z133.1. Pruning cuts or damaged bark shall be cut clean to heal. No tree seal or paint shall be used after pruning.						
CULTURAL RESOURCES						
CUL-1(a): Historic Documentation Package						
Prior to issuance of demolition permits, the County shall ensure that documentation of the buildings proposed for demolition is completed in the form of a Historic American Building Survey (HABS)-like documentation that shall comply with the Secretary of the Interior's Standards for Architectural and Engineering Documentation (National Park Service [NPS] 1990). The documentation shall generally follow the HABS Level III requirements and include digital photographic recordation,	Verify documentation of adobe buildings to be demolished, consistent with Secretary of the Interior's *Standards for Architectural and Engineering Documentation*	Prior to issuance of demolition permit	County of San Mateo Parks Department			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Responsible Agency	Compliance Verification		
				Initial	Date	Comments
detailed historic narrative report, and compilation of historic research. The documentation shall be completed by a qualified architectural historian or historian who meets the Secretary of the Interior's Professional Qualification Standards for History and/or Architectural History (NPS 1983). The original archival-quality documentation shall be offered as donated material to the County of San Mateo Parks Department where it would be available for current and future generations. Archival copies of the documentation also shall be submitted to the San Mateo County Libraries and the San Mateo County History Museum where they would be available to local researchers. Completion of this mitigation measure shall be monitored and enforced by the lead agency.	Submit historic documentation to San Mateo County Libraries and San Mateo County History Museum					
CUL-1(b): Standards of Review						
The seismic retrofit of the adobe administrative office building shall be consistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings* (Standards), thereby avoiding significant adverse direct or indirect impacts to historical resources. An architectural historian or historic architect meeting the Secretary of the Interior's Professional Qualifications Standards shall be retained to prior to the start of the seismic retrofit to review proposed plans and provide input to the County to avoid any direct or indirect physical changes to the building. The findings and recommendations of the architectural historian or historic architect shall be documented in a Standards Project Review Memorandum, at the schematic design phase. This memorandum shall analyze all project components for compliance with the Standards. Should design modifications be necessary to bring projects into compliance with the Standards, the memorandum shall document those recommendations. The document shall be subsequently submitted to County of San Mateo Parks Department for review and comment.	Retain architectural historian or historic architect to review plans for seismic retrofit of adobe administrative office building; Review documentation of findings in Standards Project Review Memorandum	Prior to seismic retrofit of adobe administrative office building	County of San Mateo Parks Department			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Responsible Agency	Compliance Verification		
				Initial	Date	Comments
CUL-2(a): Archaeological Resources						
If archaeological resources are encountered during ground-disturbing activities, work in the immediate area shall be halted and an archaeologist meeting the Secretary of the Interior's Professional Qualifications Standards for archaeology (NPS 1983) shall be contacted immediately to evaluate the find. If necessary, the evaluation may require preparation of a treatment plan and archaeological testing for CRHR eligibility. If the discovery proves to be significant under CEQA and cannot be avoided by the proposed project, additional work such as data recovery excavation may be warranted to mitigate any significant impacts to historical resources.	Halt work in the immediate area if any cultural resources are encountered during ground disturbing activities and contact an archaeologist to evaluate the find; Complete mitigation if significant resources found	During ground-disturbing activities	County of San Mateo Parks Department			
CUL-2(b): Unanticipated Discovery of Human Remains						
If human remains are found, State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the County Coroner shall be notified immediately. If the human remains are determined to be prehistoric, the coroner shall notify the Native American Heritage Commission, which will determine and notify a most likely descendant (MLD). The MLD shall complete the inspection of the site within 48 hours of notification and may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials.	Halt work in the immediate area if any human remains are encountered during ground disturbing activities and contact the County Coroner and/or NAHC	During ground-disturbing activities	County of San Mateo Parks Department			
CUL-3: Unanticipated Discovery of Paleontological Resources						
In the event of a fossil discovery by construction personnel, all work in the immediate vicinity of the find shall cease and a qualified paleontologist shall be contacted to evaluate the find before restarting work in the area. The qualified paleontologist shall be an individual with an M.S. or Ph.D. in paleontology or geology who is experienced with paleontological procedures and techniques, who is knowledgeable in the geology of California,	Halt work in the immediate area if any fossil resources are encountered during ground disturbing activities and contact a paleontologist to evaluate the find;	During ground-disturbing activities	County of San Mateo Parks Department			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Responsible Agency	Compliance Verification		
				Initial	Date	Comments
and who has worked as a paleontological mitigation project supervisor for a least one year (SVP 2010). If the qualified paleontologist determines that the fossil(s) is (are) scientifically significant, the find shall be recovered under his/her supervision. The paleontologist shall have the authority to temporarily direct, divert or halt construction activity to ensure that the fossil(s) can be removed in a safe and timely manner. Once salvaged, significant fossils shall be identified to the lowest possible taxonomic level, prepared to a curation-ready condition and curated in a scientific institution with a permanent paleontological collection (such as the University of California Museum of Paleontology), along with all pertinent field notes, photos, data, and maps. Fossils of undetermined significance at the time of collection may also warrant curation at the discretion of the project paleontologist.	Complete resource recovery if significant resources found					
NOISE						
N-3(a): Restrict Sound Amplification Equipment and Prohibit Air Horns						
Sound amplification equipment at organized athletic games and practices and at the amphitheater shall only be allowed with the procurement of a special event permit in accordance with County of San Mateo Parks Department procedures. The County shall notify all groups using the proposed multi-use field, soccer/lacrosse field, and amphitheater of this requirement. The County shall prohibit the use of air horns at any park events. County staff shall periodically patrol the park during organized athletic events and performances to verify that park users are not operating air horns and are not operating sound amplification equipment without an approved Special Event Permit. Special Event Permits are required for any use of a space beyond what is considered typical use. This could include such activities as: bounce houses, amplified sound, large events (walks, runs) and those that require additional staffing or support from other agencies. Depending on the scale of the event, notification may	Review applications for Special Event Permits involving use of sound amplification; Recommended notification upon approval of such permits; Periodically patrol the park during organized events	Periodic patrols during organized athletic events and performances	County of San Mateo Parks Department			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Responsible Agency	Compliance Verification		
				Initial	Date	Comments
be posted in park kiosks, on the Parks Department website or by using other communication vehicles.						
N-3(b): Timing of Athletic Events						
To minimize noise that may disturb neighbors of Flood County Park, the County shall restrict athletic practices and games at the park to the hours of 9 A.M. to 8 P.M	Prevent scheduling of organized athletic practices and games before 9 A.M. or after 8 P.M.	During operation of athletic fields	County of San Mateo Parks Department			
TRANSPORTATION AND CIRCULATION						
T-5(a): Bicycle Storage						
The County shall install a minimum of six bicycle racks near the proposed gathering plaza.	Install bicycle racks	Prior to completion of Phase I improvements	County of San Mateo Parks Department			
T-5(b): Pedestrian Signage						
The County shall install signage in a central location in Flood County Park that informs visitors of an alternative pedestrian route around the segment of Bay Road between Del Norte Avenue and Sonoma Avenue which lacks a sidewalk. This signage shall include a map of the alternative pedestrian route on Del Norte Avenue, Oakwood Place, and Sonoma Avenue.	Install signage showing alternative pedestrian route	Prior to completion of Phase I improvements	County of San Mateo Parks Department			
T-6: Parking Education and Enforcement						
The County shall inform park visitors of on-street parking restrictions on nearby residential streets and shall post this information in a clearly visible location on-site. The County also shall coordinate with the City of Menlo Park to reduce parking in the adjacent neighborhoods, including proactive communication when peak use of Flood County Park is anticipated (i.e., on weekday evenings and on weekend days when all picnic areas are reserved and all athletic fields are scheduled for concurrent use) and encouraging increased random enforcement of on-street parking restrictions.	Inform park visitors of on-street parking restrictions; Coordinate with City of Menlo Park to encourage parking enforcement	Prior to completion of Phase I improvements; During operation of the Landscape Plan	County of San Mateo Parks Department			

Mitigation Measure/ Condition of Approval	Action Required	Monitoring Timing	Responsible Agency	Compliance Verification		
				Initial	Date	Comments
TRIBAL CULTURAL RESOURCES						
TCR-1: Protection of Tribal Cultural Resources						
In the event that archaeological resources of Native American origin are identified during construction of recreational improvements proposed in the Landscape Plan, the qualified archaeologist will consult with the County to begin or continue Native American consultation procedures. If, in consultation with the County, a discovery is determined to be a tribal cultural resource and thus significant under CEQA, the County shall avoid the resource if feasible. If the resource cannot be avoided, the County shall prepare and implement a mitigation plan in accordance with State guidelines and in consultation with Native American groups.	Halt work in the immediate area if any tribal cultural resources are encountered during ground disturbing activities and contact an archaeologist to evaluate the find Prepare and implement mitigation plan in consultation with Native American groups if required	During ground-disturbing activities	County of San Mateo Parks Department			

County of San Mateo
Integrated Pest Management (IPM) Policy

GOAL

The County of San Mateo (County) seeks to protect the health and safety of its employees and the general public, the environment and water quality, as well as to provide sustainable solutions for pest control, through the reduced use of pesticides on property owned or managed by the County to the maximum extent practicable.

IMPLEMENTATION

1. Employees implementing pest management operations will use Integrated Pest Management (IPM) techniques that emphasize non-pesticide alternatives where feasible and, when necessary, employ the least toxic chemicals. Preference will be given to IPM certified contractors or contractors who implement IPM. County departments and their contractors that apply pesticides will develop and maintain an active IPM Plan to ensure the long-term prevention and suppression of pest problems with minimum negative impacts on the health and safety of the community and environment. The County will track employee and contractor pesticide use and prepare an annual report summarizing pesticide use and evaluating pest control activities performed.

2. The County shall encourage pilot projects to demonstrate landscape and structural pest control alternatives, seeking to use the most recent technology, best management practices and least toxic methods for all pest control measures. Pilot projects should include an objective analysis of the effectiveness of the alternative techniques applied.

3. The County will review its purchasing procedures, contracts or service agreements with pesticide applicators and employee training practices to determine what changes can be made to support the goal of pesticide reduction and promote the purchase and use of the least harmful chemicals.

4. The County will perform educational outreach and/or support Countywide or regional efforts to educate residential and commercial pesticide users on a) goals and techniques of IPM, and b) pesticide related water quality issues.

DEFINITIONS

Pesticides are defined as: any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest. Pests can be insects, rodents and other animals, unwanted plants (weeds), bacteria or fungi. The term pesticide applies to herbicides, fungicides, insecticides, rodenticides, molluscicides and other substances used to control pests. Antimicrobial agents are not included in this definition of pesticides. In general, the intent of antimicrobial agents is to reduce or mitigate the growth or development of microbial organisms.

Integrated Pest Management (IPM) is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides shall be used only if the above techniques are found to be either ineffective or economically infeasible. Pesticide use shall be in accordance with established guidelines, and treatments shall be made with the goal of removing only target organisms. Pest control materials shall be selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment.

IPM techniques could include biological controls (e.g., ladybugs and other natural enemies or predators); physical or mechanical controls (e.g., hand labor or mowing); cultural controls (e.g., mulching, discing, or alternative plant type selection); and reduced risk chemical controls (e.g., soaps or oils).

County owned or managed property includes but is not limited to: parks and open space; golf courses; roadsides; landscaped medians; flood control channels; buildings, structures, and other outdoor property owned or managed by the County.

Limited Asbestos & Lead Survey Report

County of San Mateo Parks Department
Flood Park
215 Bay Road
Menlo Park, California

July 21, 2023

Terracon Project No. R1237389

Prepared for:

Hannah Ormshaw
County of San Mateo Parks Department
455 County Center, 4th Floor
Redwood City, California 94063

Prepared by:

Terracon Consultants, Inc.
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Concord, California 94520
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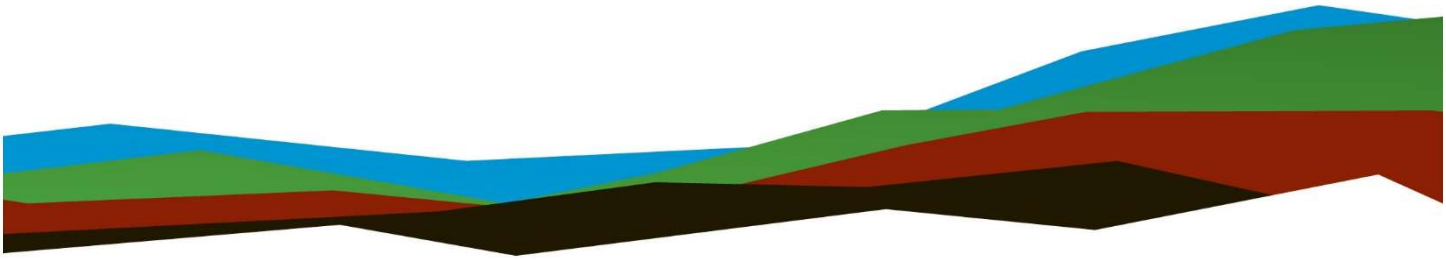

Report Prepared by: Wyatt Renner
Wyatt Renner
Industrial Hygienist, CSST # 15-5504

Report Reviewed by: Karin Schroeter
Karin Schroeter
Project Manager CAC #92-0772, CDPH #2228

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- Geotechnical
- Materials

Limited Asbestos & Lead Survey Report

County of San Mateo Parks Department
Flood Park
215 Bay Road
Menlo Park, California

Scope of Work

The following is a report of a limited asbestos and lead survey conducted by Mike Harrington, Certified Site Surveillance Technician (CSST) and California Department of Public Health (CDPH) Lead Sampling Technician with Terracon Consultants, Inc. (Terracon). The survey was performed on June 8, 2023, at Flood Park located in Menlo Park, California.

Terracon was asked to limit the sampling to the materials that would be impacted by the upcoming renovation work within various locations throughout the park. This included destructive testing of two (2) restrooms as well as various hardscape surfaces, trash enclosures, and the tennis courts.

Results

A total of four (4) homogeneous suspect asbestos-containing materials (ACMs) were identified. The samples were analyzed using polarized light microscopy (PLM) techniques in accordance with methodology approved by the U.S. Environmental Protection Agency (EPA). As set forth in the Code of Federal Regulations, 40 CFR Part 763, Appendix A to Subpart F, Section 1.2 and 1.7.2.4, the lower limit of reliable detection for asbestos using the PLM method is approximately one percent (1%) by volume.

Asbestos was not detected in the sampled materials. A summary of the sample results is provided in the following table.

TABLE I
SAMPLED MATERIALS

Material Description	General Sample Locations	Sample Results
Concrete - Grey	Men's Restroom Floor by Tennis Court C-Restroom Floor by Volleyball Court Waste Bin by Marble BBQ Area North Drinking Fountain Waste Bin Pad by Foundation Office #3 Waste Bin Pads #4 - #12 Bear Pin Pad by Tennis Court Drinking Fountain Pad South of Volleyball Court Tennis Court Material Under Asphalt Top	None Detected
Roof Felt - Black	Adobe Restroom by Tennis Court Adobe Restroom by Volleyball Court	None Detected
Exterior Grout - Tan	Restroom by Tennis Court Restroom by #C Volleyball Court	None Detected
Asphalt and Aggregate Base	Trail – South of Tennis Court Trail – North of Tennis Court Trail – South Back Cover Trail – North of Volleyball Court Trail – Parking Lot SE End of Lot Trail – Parking Lot on Speed Bump Asphalt Parking Lot by Play Structure Ball Field Restroom Trail by Foundation Office Ball Field Restroom Parking Lot Behind Gate Entry Tennis Court Top Layer	None Detected

Eight (8) paint samples were submitted for lead content using Flame Atomic Absorption spectroscopy in accordance with EPA Method SW846-3050B-7420. When "<" appears in the adjacent to the analytical value, it should be interpreted as meaning the concentration was below the analytical method detection limit.

Six (6) of the samples contained lead in detectable concentrations and are shown in bold font in the following table.

TABLE II
LEAD IN PAINT

Sample Number	Description/Location of Sample	Results mg/kg (ppm)
L-1	**Green Paint on Wood Toe Board at Tennis Court**	**31,000**
L-2	**Tan Paint on Wood Walls at Tennis Court Restroom**	**340**
L-3	White Paint on Brick Walls at Men's Restroom by Tennis Court	<40
L-4	Brown Paint on Wood Fence by Tennis Court Restroom Entry	<39
L-5	**Red Paint on Concrete Floor by Tennis Court Men's Restroom**	**85**
L-6	**Blue Parking Stripe on Asphalt – Parking Lot SW**	**2,700**
L-7	**White Parking Stripe on Asphalt by Men's Restroom**	**15,000**
L-8	**Yellow Paint on Speed Bump in Parking Lot**	**77,000**

mg/kg – milligrams per kilogram, ppm – parts per million

Limitations

Our services consist of professional opinions, conclusions and recommendations that are made in accordance with generally accepted consulting standards, principles and practices. Reasonable attempts have been made to ensure that the report is complete and accurate with respect to Terracon's authorized scope of work. Terracon assumes no liability for damages, which might result from errors contained in the report or conditions, which the report fails to disclose. The quantity of samples, sample locations, and analyses performed were selected to provide analytical data to document and evaluate current site conditions. The reporting of bulk analytical results is presented as estimates resulting from analysis by EPA-approved methods.

The information provided in this report is not intended to be used as a biddable document for abatement purposes.

Laboratory Results and Chain of Custody - Asbestos

eurofins | Built Environment Testing

Report for:

Ms. Karin Schroeter
Terracon Consultants, Inc.-Oakland
1220 Concord Avenue
Suite 450
Concord, CA 94520

Regarding: Eurofins EPK Built Environment Testing, LLC
Project: R1237389; County of San Mateo Parks Depart. Flood Park 215 Bay Rd
EML ID: 3287925

Approved by:

Approved Signatory
Danny Li

Dates of Analysis:
Asbestos PLM: 06-14-2023

Service SOPs: Asbestos PLM (EPA 40CFR App E to Sub E of Part 763 & EPA METHOD 600/R-93-116, SOP EM-AS-S-1267)
NVLAP Lab Code 200757-0

Eurofins EPK Built Environment Testing, LLC
2841 Dow Avenue, Suite 300, Tustin, CA 92780
(800) 651-4802 www.eurofinsus.com/Built

Client: Terracon Consultants, Inc.-Oakland
C/O: Ms. Karin Schroeter
Re: R1237389; County of San Mateo Parks Depart.
Flood Park 215 Bay Rd

Date of Sampling: 06-08-2023
Date of Receipt: 06-12-2023
Date of Report: 06-14-2023

ASBESTOS PLM REPORT

Total Samples Submitted:	39
Total Samples Analyzed:	39
Total Samples with Layer Asbestos Content > 1%:	0

Location: 1-A, Concrete-Grey, Adobe RR Floor By Tennis Court-Men's Lab ID-Version‡: 15968890-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 1-B, Concrete-Grey, Adobe RR Floor-C Restroom By Volleyball Courts Lab ID-Version‡: 15968891-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 1-C, Concrete-Grey, Waste Bin By Marble BBQ Area-Pad Lab ID-Version‡: 15968892-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 1-D, Concrete-Grey, North Drinking Fountain- By Front Structure Lab ID-Version‡: 15968893-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
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Eurofins EPK Built Environment Testing, LLC
2841 Dow Avenue, Suite 300, Tustin, CA 92780
(800) 651-4802 www.eurofinsus.com/Built

Client: Terracon Consultants, Inc.-Oakland
C/O: Ms. Karin Schroeter
Re: R1237389; County of San Mateo Parks Depart.
Flood Park 215 Bay Rd

Date of Sampling: 06-08-2023
Date of Receipt: 06-12-2023
Date of Report: 06-14-2023

ASBESTOS PLM REPORT

Location: 1-E, Concrete-Grey, Waste Bin Pad By Foundation Office #3 Lab ID-Version‡: 15968894-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 1-F, Concrete-Grey, Waste Bin Pad #4 Lab ID-Version‡: 15968895-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 1-G, Concrete-Grey, Waste Bin Pad #5 Lab ID-Version‡: 15968896-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 1-H, Concrete-Grey, Waste Bin Pad #6 Lab ID-Version‡: 15968897-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

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ASBESTOS PLM REPORT

Location: 1-I, Concrete-Grey, Waste Bin Pad #7 Lab ID-Version‡: 15968898-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 1-J, Concrete-Grey, Waste Bin Pad #8 Lab ID-Version‡: 15968899-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 1-K, Concrete-Grey, Waste Bin Pad #9 Lab ID-Version‡: 15968900-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 1-L, Concrete-Grey, Bear Bin Pad By Tennis Court Lab ID-Version‡: 15968901-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

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ASBESTOS PLM REPORT

Location: 1-M, Concrete-Grey, Waste Bin Pad 10 Lab ID-Version‡: 15968902-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 1-N, Concrete-Grey, Waste Bin Pad 11 Lab ID-Version‡: 15968903-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 1-O, Concrete-Grey, Waste Bin Pad 12 Lab ID-Version‡: 15968904-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 1-P, Concrete-Grey, Drinking Fountain Pad South of Volleyball Court Lab ID-Version‡: 15968905-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

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C/O: Ms. Karin Schroeter
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Flood Park 215 Bay Rd

Date of Sampling: 06-08-2023
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Date of Report: 06-14-2023

ASBESTOS PLM REPORT

Location: 1-Q, Concrete-Grey, Tennis Court Material Under Asphalt Top Lab ID-Version‡: 15968906-1

Sample Layers	Asbestos Content
Gray Concrete	ND
Sample Composite Homogeneity:	Good

Location: 2-A, Roof Felt-Black, Adobe Restroom By Tennis Court Lab ID-Version‡: 15968907-1

Sample Layers	Asbestos Content
Black Roofing Felt	ND
Composite Non-Asbestos Content:	60% Cellulose
Sample Composite Homogeneity:	Good

Location: 2-B, Roof Felt-Black, Adobe Restroom By Tennis Court Lab ID-Version‡: 15968908-1

Sample Layers	Asbestos Content
Black Roofing Felt	ND
Composite Non-Asbestos Content:	60% Cellulose
Sample Composite Homogeneity:	Good

Location: 2-C, Roof Felt-Black, Adobe Restroom By Tennis Court Lab ID-Version‡: 15968909-1

Sample Layers	Asbestos Content
Black Roofing Felt	ND
Composite Non-Asbestos Content:	60% Cellulose
Sample Composite Homogeneity:	Good

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Client: Terracon Consultants, Inc.-Oakland
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Re: R1237389; County of San Mateo Parks Depart.
Flood Park 215 Bay Rd

Date of Sampling: 06-08-2023
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ASBESTOS PLM REPORT

Location: 2-D, Roof Felt-Black, Adobe Restroom-C-By Volleyball Lab ID-Version‡: 15968910-1

Sample Layers	Asbestos Content
Black Roofing Felt	ND
Composite Non-Asbestos Content:	60% Cellulose
Sample Composite Homogeneity:	Good

Location: 2-E, Roof Felt-Black, Adobe Restroom-C-By Volleyball Lab ID-Version‡: 15968911-1

Sample Layers	Asbestos Content
Black Roofing Felt	ND
Composite Non-Asbestos Content:	60% Cellulose
Sample Composite Homogeneity:	Good

Location: 2-F, Roof Felt-Black, Adobe Restroom-C-By Volleyball Lab ID-Version‡: 15968912-1

Sample Layers	Asbestos Content
Black Roofing Felt	ND
Composite Non-Asbestos Content:	60% Cellulose
Sample Composite Homogeneity:	Good

Location: 3-A, RR Ext Grout-Tan, RR By Tennis Court Lab ID-Version‡: 15968913-1

Sample Layers	Asbestos Content
Tan Grout	ND
Sample Composite Homogeneity:	Good

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Date of Report: 06-14-2023

ASBESTOS PLM REPORT

Location: 3-B, RR Ext Grout-Tan, RR By Tennis Court Lab ID-Version‡: 15968914-1

Sample Layers	Asbestos Content
Tan Grout	ND
Sample Composite Homogeneity:	Good

Location: 3-C, RR Ext Grout-Tan, RR By #C VB Court Lab ID-Version‡: 15968915-1

Sample Layers	Asbestos Content
Tan Grout	ND
Sample Composite Homogeneity:	Good

Location: 3-D, RR Ext Grout-Tan, RR By #C By VB Court Lab ID-Version‡: 15968916-1

Sample Layers	Asbestos Content
Tan Grout	ND
Sample Composite Homogeneity:	Good

Location: 4-A, Asphalt, Asphalt Trail-South of Tennis Court Lab ID-Version‡: 15968917-1

Sample Layers	Asbestos Content
Gray/Black Asphalt	ND
Sample Composite Homogeneity:	Good

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Date of Report: 06-14-2023

ASBESTOS PLM REPORT

Location: 4-B, Asphalt, Asphalt Trail-North of Tennis Court Lab ID-Version‡: 15968918-1

Sample Layers	Asbestos Content
Gray/Black Asphalt	ND
Sample Composite Homogeneity:	Good

Location: 4-C, Asphalt, Asphalt Trail-South Back Corner Lab ID-Version‡: 15968919-1

Sample Layers	Asbestos Content
Gray/Black Asphalt	ND
Sample Composite Homogeneity:	Good

Location: 4-D, Asphalt, Asphalt Trail-North of Volley Ball Court Lab ID-Version‡: 15968920-1

Sample Layers	Asbestos Content
Gray/Black Asphalt	ND
Sample Composite Homogeneity:	Good

Location: 4-E, Asphalt, Asphalt Trail-Parking Lot SE-End of Lot Lab ID-Version‡: 15968921-1

Sample Layers	Asbestos Content
Gray/Black Asphalt	ND
Sample Composite Homogeneity:	Good

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ASBESTOS PLM REPORT

Location: 4-F, Asphalt, Asphalt Trail-PArking Lot on Speed Bump Lab ID-Version‡: 15968922-1

Sample Layers	Asbestos Content
Gray/Black Asphalt	ND
Sample Composite Homogeneity:	Good

Location: 4-G, Asphalt, Asphalt Parking Lot by Play Structure Lab ID-Version‡: 15968923-1

Sample Layers	Asbestos Content
Gray/Black Asphalt	ND
Sample Composite Homogeneity:	Good

Location: 4-H, Asphalt, Ball Field RR-Diff Type Asphalt-M Lab ID-Version‡: 15968924-1

Sample Layers	Asbestos Content
Gray/Black Asphalt	ND
Sample Composite Homogeneity:	Good

Location: 4-I, Asphalt, Asphalt Trail by Foundation Office-N Lab ID-Version‡: 15968925-1

Sample Layers	Asbestos Content
Gray/Black Asphalt	ND
Sample Composite Homogeneity:	Good

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Client: Terracon Consultants, Inc.-Oakland
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Re: R1237389; County of San Mateo Parks Depart.
Flood Park 215 Bay Rd

Date of Sampling: 06-08-2023
Date of Receipt: 06-12-2023
Date of Report: 06-14-2023

ASBESTOS PLM REPORT

Location: 4-J, Asphalt, Ball Field RR-Diff Type of Asphalt-S Lab ID-Version‡: 15968926-1

Sample Layers	Asbestos Content
Gray/Black Asphalt	ND
Sample Composite Homogeneity:	Good

Location: 4-K, Asphalt, Parking Lot-Behind Gate Entry Lab ID-Version‡: 15968927-1

Sample Layers	Asbestos Content
Gray/Black Asphalt	ND
Sample Composite Homogeneity:	Good

Location: 4-L, Asphalt, Tennis Court Top Layer Lab ID-Version‡: 15968928-1

Sample Layers	Asbestos Content
Gray/Black Asphalt	ND
Sample Composite Homogeneity:	Good

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003287925

Terracon

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☒ PM – K. Schroeter kmschroeter@terracon.com
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☐ PM – D.WALLEN d.wallen@terracon.com
☐ ADMIN ASST. Heidi.santos@terracon.com

ACM BULK SAMPLE DATA SHEET

☒ PLM Analysis (Analyze all samples)
☐ Stop Analysis at First Positive
☐ Point Count Analysis (1000-point

Project Name/ Address/ Building No. COUNTY OF SAN MATEO PARKS DEPART. FLOOD PARK 215 BAY RD.

Project# R1237389 **Sampled By:** Mike Harrington **Sampling Date:** 6-8-23

Sample(s) sent to: ☐ MAL ☐ SGS ☒ EMLAB _____ TAT ☐ Rush ☐ 24HRS ☒ 48

FAX OR E-MAIL REPORT TO: *SEE ABOVE PROJECT MANAGER (PM)**
***ADDITIONAL REPORT RECIPIENT(S): mdharrington@terracon.com ***

HM# 1	Material Description-CONCRETE-GREY	
Sample ID	Sample Location & Material Location	Quantity:
1-A	ADOBE RR FLOOR BY TENNIS COURT-MEN'S	
1-B	ADOBE RR FLOOR-C RESTROOM BY VOLLEY BALL COURTS	
1-C	WASTE BIN BY MABLE BBQ AREA-PAD	

HM# 1	MATERIAL Description-CONCRETE-GREY	
Sample ID	Sample Location & Material Location	Quantity ;
1-D	NORTH DRINKING FOUNTAIN-BY FRONT STRUCTURE	
1-E	WASTE BIN PAD BY FOUNDATION OFFICE-#3	
1-F	WASTE BIN PAD-#4	

HM# 1	MATERIAL Description-CONCRETE-GREY	
Sample ID	Sample Location & Material Location	Quantity:
1-G	WASTE BIN PAD-#5	
1-H	WASTE BIN PAD-#6	
1-I	WASTE BIN PAD-#7	

HM# 1	Material Description -CONCRETE-GREY	
Sample ID	Sample Location & Material Location	Quantity:
1-J	WASTE BIN PAD-#8	
1-K	WASTE BIN PAD-#9	
1-L	BEAR BIN PAD BY TENNIS COURT	

Relinquished By:	Mike Harrington	Signature:	MH	Date/Time:	6-8-23
Received By:	Johntang	Signature:		Date/ Time:	6/12/23 9:2
Relinquished By:		Signature:		Date/Time:	
Received By:		Signature:		Date/Time:	

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ACM BULK SAMPLE DATA SHEET

☒ PLM Analysis (Analyze all samples)
☐ Stop Analysis at First Positive
☐ Point Count Analysis (1000-point

Project Name/ Address/ Building No. COUNTY OF SAN MATEO PARKS DEPART. FLOOD PARK 215 BAY RD.

Project# R1237389 **Sampled By:** Mike Harrington **Sampling Date:** 6-8-23

Sample(s) sent to: ☐ MAL ☐ SGS ☒ EMLAB _____ **TAT** ☐ Rush ☐ 24HRS ☒ 48

FAX OR E-MAIL REPORT TO: *SEE ABOVE PROJECT MANAGER (PM)**
***ADDITIONAL REPORT RECIPIENT(S): mdharrington@terracon.com ***

HM# 1	Material Description-CONCRETE-GREY	
Sample ID	Sample Location & Material Location	Quantity:
1-M	WASTE BIN PAD-10	
1-N	WASTE BIN PAD-11	

HM# 1	MATERIAL Description-CONCRETE-GREY	
Sample ID	Sample Location & Material Location	Quantity ;
1-O	WASTE BIN PAD-12	
1-P	DRINGING FOUNTAIN PAD SOUTH OF VOLLEY BALL COURT	
1-Q	Tennis court material under Asphalt Top	

HM# 2	MATERIAL Description-ROOF FELT-BLACK	
Sample ID	Sample Location & Material Location	Quantity:
2-A	ADOBE RESTROOM BY TENNIS COURT	
2-B	↓	
2-C	↓	

HM# 2	Material Description -ROOF FELT -BLACK	
Sample ID	Sample Location & Material Location	Quantity:
2-D	ADOBE RESTROOM -C-BY VOLLEY BALL	
2-E	↓	
2-F	↓	

Relinquished By:	Mike Harrington	Signature:	M.H	Date/Time:	6-8-23
Received By:	Johntavy	Signature:		Date/ Time:	6/12/23 9:2
Relinquished By:		Signature:		Date/Time:	
Received By:		Signature:		Date/Time:	

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☐ Point Count Analysis (1000-point

Project Name/ Address/ Building No. COUNTY OF SAN MATEO PARKS DEPART. FLOOD PARK 215 BAY RD.

Project# R1237389 **Sampled By:** Mike Harrington **Sampling Date:** 6-8-23

Sample(s) sent to: ☐ MAL ☐ SGS ☒ EMLAB _____ TAT ☐ Rush ☐ 24HRS ☒ 48

FAX OR E-MAIL REPORT TO: *SEE ABOVE PROJECT MANAGER (PM)**
***ADDITIONAL REPORT RECIPIENT(S): mdharrington@terracon.com ***

HM# 3	Material Description- RR Ext Grout - TAN	Quantity: 360 SF
Sample ID	Sample Location & Material Location	
3A	RR by tennis court	
3B		
3C	RR by #C VB court	

HM# 3	MATERIAL Description- RR Ext Grout - TAN	Quantity; 864 SF
Sample ID	Sample Location & Material Location	
3D	RR by #C by VB court	

HM# 4	MATERIAL Description- Asphalt	Quantity:
Sample ID	Sample Location & Material Location	
4A	Asphalt trail - south of Tennis court	
4B	- North of Tennis court	
4C	- south back corner	

HM# 4	Material Description - Asphalt	Quantity:
Sample ID	Sample Location & Material Location	
4D	Asphalt trail - North of volley ball court	
4E	- Parking Lot SE-end of Lot	
4F	- Parking Lot on Speed Bump	

Relinquished By:	Mike Harrington	Signature:	mh	Date/Time:	6-8-23
Received By:	Johnfang	Signature:		Date/ Time:	6/12/23 9:3
Relinquished By:		Signature:		Date/Time:	9
Received By:		Signature:		Date/Time:	

003287925

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ACM BULK SAMPLE DATA SHEET

☐ PLM Analysis (Analyze all samples)
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☐ Point Count Analysis (1000-point

PAGE 4 OF 4

Project Name/ Address/ Building No. COUNTY OF SAN MATEO PARKS DEPART. FLOOD PARK 215 BAY RD.

Project# R1237389 **Sampled By:** Mike Harrington **Sampling Date:** 6-8-23

Sample(s) sent to: ☐ MAL ☐ SGS ☒ EMLAB _____ **TAT** ☐ Rush ☐ 24HRS ☒ 48

FAX OR E-MAIL REPORT TO: *SEE ABOVE PROJECT MANAGER (PM)**
***ADDITIONAL REPORT RECIPIENT(S):** mdharrington@terracon.com ***

HM# 4	Material Description- Asphalt	
Sample ID	Sample Location & Material Location	Quantity:
4G	Asphalt parking Lot by play stucture	
4H	Ball Field RR - Diff type Asphalt - N	
4I	Asphalt trail by Foundation office - W	

HM# 4	MATERIAL Description- Asphalt	
Sample ID	Sample Location & Material Location	Quantity ;
4-J	Ball Field RR - Diff type of Asphalt - S	
4-K	Parking Lot - Behind gate Entry	
4-L	Tennis court TOP Layer	

HM#	MATERIAL Description-	
Sample ID	Sample Location & Material Location	Quantity:

HM#	Material Description -	
Sample ID	Sample Location & Material Location	Quantity:

Relinquished By:	Mike Harrington	Signature:	MH	Date/Time:	6-8-23
Received By:	Johntang	Signature:		Date/ Time:	6/12
Relinquished By:		Signature:		Date/Time:	
Received By:		Signature:		Date/Time:	

Laboratory Results and Chain of Custody - Lead

eurofins | Built Environment Testing

Report for:

Ms. Karin Schroeter
Terracon Consultants, Inc.-Oakland
1220 Concord Avenue
Suite 450
Concord, CA 94520

Regarding: Eurofins EPK Built Environment Testing, LLC
Project: R1237389; County of Sa Mateo Parks Dept.Floor Park - 215 Bay Rd.
EML ID: 3287931

Approved by:

Laboratory Manager
Danny Li

Dates of Analysis:
Lead - Flame AA: 06-14-2023

Service SOPs: Lead - Flame AA (EM-BC-S-8443)
AIHA-LAP, LLC accredited service, Lab ID #178697

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. Due to the nature of the analyses performed, field blank correction of results is not applied. The results relate only to the samples as received and tested. Sample size, as it relates to Wipe samples only, is supplied by the client.

Eurofins EPK Built Environment Testing, LLC ("the Company"), a member of the Eurofins Built Environment Testing group of companies, shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.
Eurofins EPK Built Environment Testing, LLC's LabServe® reporting system includes automated fail-safes to ensure that all AIHA-LAP, LLC quality requirements are met and notifications are added to reports when any quality steps remain pending.

Eurofins EPK Built Environment Testing, LLC
2841 Dow Avenue, Suite 300, Tustin, CA 92780
(800) 651-4802 www.eurofinsus.com/Built

Client: Terracon Consultants, Inc.-Oakland
C/O: Ms. Karin Schroeter
Re: R1237389; County of Sa Mateo Parks Dept.Floor Park - 215 Bay Rd.

Date of Sampling: 06-08-2023
Date of Receipt: 06-12-2023
Date of Report: 06-14-2023

LEAD: FLAME ATOMIC ABSORPTION SPECTROMETRY

Location:	L-1: Green Wood Toe Board	L-2: Tan Wood Walls	L-3: White Brick Walls	L-4: Brown Wood Fence
Comments (see below)	None	None	None	None
Lab ID-Version‡:	15959122-1	15959123-1	15959124-1	15959125-1
Analysis Date:	06/14/2023	06/14/2023	06/14/2023	06/14/2023
Sample type	Paint Chip sample	Paint Chip sample	Paint Chip sample	Paint Chip sample
Method*	NIOSH 7082 & EPA 7000B modified	NIOSH 7082 & EPA 7000B modified	NIOSH 7082 & EPA 7000B modified	NIOSH 7082 & EPA 7000B modified
† Method Reporting Limit	39 ppm	39 ppm	40 ppm	39 ppm
Sample size	0.2548 grams	0.2585 grams	0.2515 grams	0.2558 grams
§Total Lead Result	31000 ppm	340 ppm	< 40 ppm	< 39 ppm

Comments:

Sample results have not been corrected for blank values.

Bulk samples are not covered under the AIHA-LAP, LLC service accreditation.

Wipe samples must meet ASTM E1792 criteria. Method Reporting Limits may not be valid for non-ASTM E1792 wipe samples.

*Sample preparation and analytical methods are based upon NIOSH 7082 and EPA 7000B.

† The Method Reporting Limit is the minimum concentration of Lead that the laboratory can confidently detect in the sample.

§ Total Lead Result has been rounded to two significant figures to reflect analytical precision.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

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Client: Terracon Consultants, Inc.-Oakland
C/O: Ms. Karin Schroeter
Re: R1237389; County of Sa Mateo Parks Dept.Floor Park - 215 Bay Rd.

Date of Sampling: 06-08-2023
Date of Receipt: 06-12-2023
Date of Report: 06-14-2023

LEAD: FLAME ATOMIC ABSORPTION SPECTROMETRY

Location:	L-5: Red Concrete Floor	L-6: Blue Asphalt Ground	L-7: White Concrete Ground	L-8: Yellow Asphalt Ground
Comments (see below)	None	None	None	None
Lab ID-Version‡:	15959126-1	15959127-1	15959128-1	15959129-1
Analysis Date:	06/14/2023	06/14/2023	06/14/2023	06/14/2023
Sample type	Paint Chip sample	Paint Chip sample	Paint Chip sample	Paint Chip sample
Method*	NIOSH 7082 & EPA 7000B modified	NIOSH 7082 & EPA 7000B modified	NIOSH 7082 & EPA 7000B modified	NIOSH 7082 & EPA 7000B modified
† Method Reporting Limit	39 ppm	40 ppm	39 ppm	40 ppm
Sample size	0.2575 grams	0.2518 grams	0.2568 grams	0.2509 grams
§Total Lead Result	85 ppm	2700 ppm	15000 ppm	77000 ppm

Comments:

Sample results have not been corrected for blank values.

Bulk samples are not covered under the AIHA-LAP, LLC service accreditation.

Wipe samples must meet ASTM E1792 criteria. Method Reporting Limits may not be valid for non-ASTM E1792 wipe samples.

*Sample preparation and analytical methods are based upon NIOSH 7082 and EPA 7000B.

† The Method Reporting Limit is the minimum concentration of Lead that the laboratory can confidently detect in the sample.

§ Total Lead Result has been rounded to two significant figures to reflect analytical precision.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

Terracon

TA***E-MAIL REPORT TO: *PROJECT MANAGER (PM)****

☐ denise.wallen@terracon.com Engineering Assistant	
☐ PM – S. Steiner spsteiner@terracon.com	☒ PM – K. Schroeter kmschroeter@terracon.com
☐ PM – K. Pilgrim kmpilgrim@terracon.com	☐ PM – W. Frieszell wmfrieszell@terracon.com
☐ PM – T. Kattchee takattchee@terracon.com	☐ PM – D. Block david.block@terracon.com

LEAD PAINT SAMPLE DATA SHEET

* Lead Analysis
X Flame AA (EPA 7420) ____ TTLC

PAGE 1 OF 2

Project Name/ Address/ Building No. COUNTY OF SA MATEO PARKS DEPT. FLOOD PARK-215 BAY RD.

Project# R1237389 **Sampled By:** MIKE HARRINGTON **Sampling Date:** 6-8-23

Sample(s) sent to: ☐ MAL ☐ EMSL ☒ EMLAB ☐ SGS **Other** Tustin

TAT ☐ Rush ☐ 24HRS ☒ 48HRS ☐ 5- Day

Sample ID	Paint Description and Sample Location	Condition (I/F/P)
L-1	Paint Color: GREEN Substrate: WOOD Component: TOE BOARD Sample Location: Bldg # TENNIS COURT Unit # 720LF Room	P
L-2	Paint Color: TAN Substrate: WOOD Component: WALLS Sample Location: Bldg # TENNIS COURT R.R Unit # 200 SF EA RR Room RR	F
L-3	Paint Color: WHITE Substrate: BRICK Component: WALLS Sample Location: Bldg # MEN'S RR Unit # 200 SF EA RR Room RR BY TENNIS COURT	F
L-4	Paint Color: BROWN Substrate: WOOD Component: FENCE Sample Location: Bldg # BY TENNIS COURT Unit # 400 SF EA BUILDING Room RR EXT ENTRY TO RR	F

Relinquished By: MIKE HARRINGTON **Signature:** MH **Date/Time:** 6-8-23

Received By: John Hong **Signature:** _____ **Date/ Time:** 6/8/23 9:2

003287931

Terracon

TA***E-MAIL REPORT TO: *PROJECT MANAGER (PM)***				
☐ denise.wallen@terracon.com Engineering Assistant				
☐ PM – S. Steiner spsteiner@terracon.com	☒ PM – K. Schroeter kmschroeter@terracon.com			
☐ PM – K. Pilgrim kmpilgrim@terracon.com		☐ PM – W. Frieszell wmfrieszell@terracon.com	☐ PM – T. Kattchee takattchee@terracon.com	☐ PM – D. Block david.block@terracon.com

LEAD PAINT SAMPLE DATA SHEET

* Lead Analysis

_____ Flame AA (EPA 7420) _____ TTLC

Project Name/ Address/ Building No. COUNTY OF SA MATEO PARKS DEPT. FLOOD PARK-215 BAY RD.

Project# R1237389 **Sampled By:** MIKE HARRINGTON **Sampling Date:** 6-8-23

Sample(s) sent to: ☐ MAL ☐ EMSL ☒ EMLAB ☐ SGS **Other** TUSTIN

TAT ☐ Rush ☐ 24HRS ☒ 48HRS ☐ 5- Day

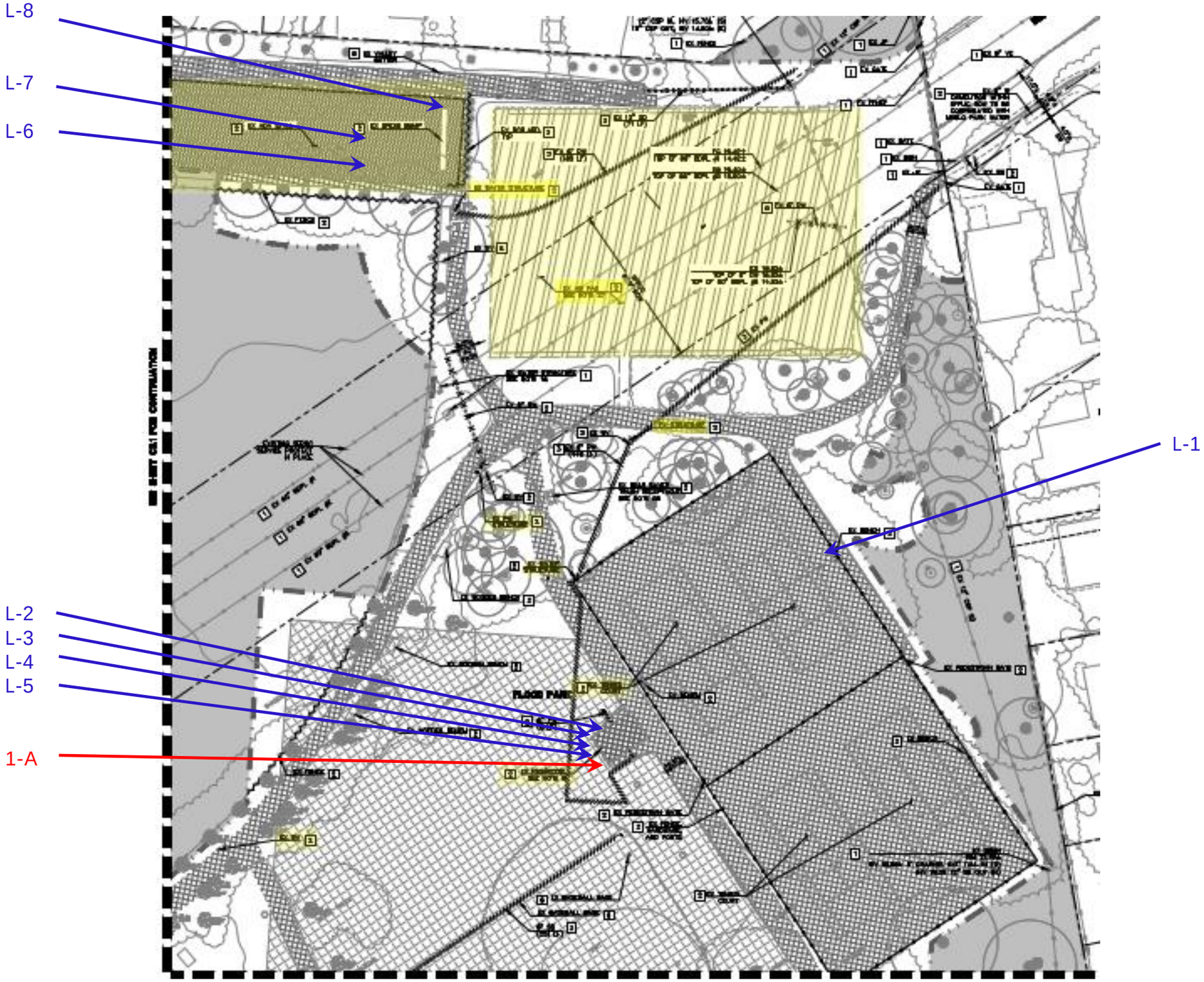
Sample ID	Paint Description and Sample Location	Condition (I/F/P)
L-5	Paint Color: RED Substrate: CONCRETE Component: FLOOR Sample Location: Bldg # MEN'S RR Unit # 260 SF Room RR BY TENNIS COURT	P
L-6	Paint Color: BLUE Substrate: ASPHALT Component: GROUND Sample Location: Bldg # PARKING STRIPE-SW Unit # Room LOT	F
L-7	Paint Color: WHITE Substrate: CONCRETE Component: GROUND Sample Location: Bldg # MEN'S RR Unit # Room LOT PARKING LINES	F
L-8	Paint Color: YELLOW Substrate: ASPHALT Component: GROUND Sample Location: Bldg # SPEED BUMP Unit # Room LOT PARKING	F

Relinquished By: MIKE HARRINGTON **Signature:** MH **Date/Time:** 6-8-23

Received By: John Fang **Signature:** [signature] **Date/ Time:** 6/12/23 9:2

003287931

Material and Sample Location Drawing



Legend:

→ Asbestos sample locations

→ Lead sample locations

N

No Scale

Terracon

San Mateo Parks Department

Flood Park

215 Bay Road

Menlo Park, California

Sample Locations

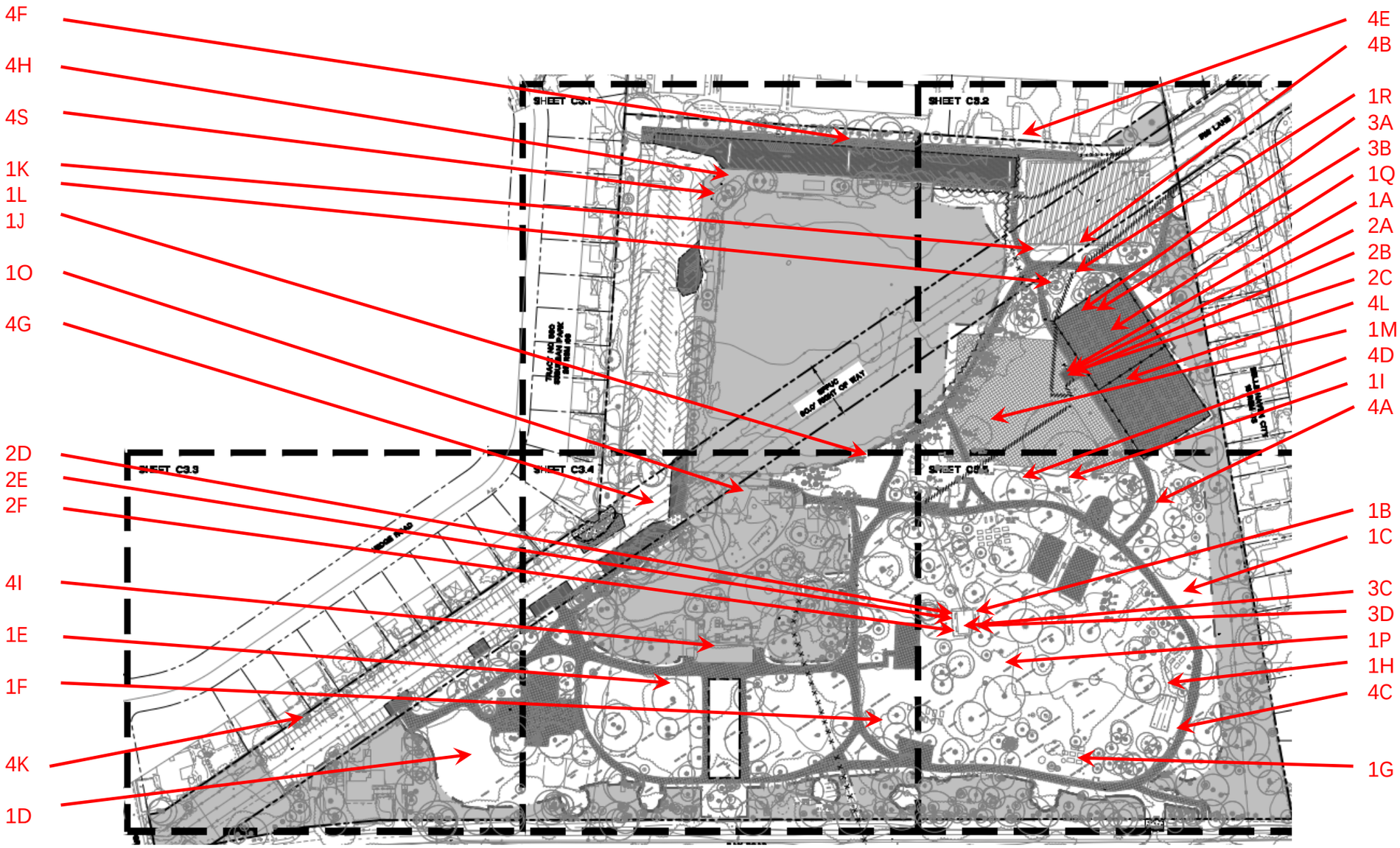
Date	Drafted By
June 2023	WBR
Project Number	**Checked By**
R1237389	KMS

Sheet Name

Flood Park

Sheet Number

Figure 1



Legend:

→ Asbestos sample locations

→ Lead sample locations

N

No Scale

Terracon

San Mateo Parks Department

Flood Park

215 Bay Road

Menlo Park, California

Sample Locations

Date	Drafted By
June 2023	WBR
Project Number	**Checked By**
R1237389	KMS

Sheet Name

Flood Park

Sheet Number

Figure 2

Site Inspector Certificate

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

LEAD-RELATED CONSTRUCTION CERTIFICATE

INDIVIDUAL:	CERTIFICATE TYPE:	NUMBER:	EXPIRATION DATE:
	Lead Project Monitor	LRC-00005358	4/26/2024
	Lead Sampling Technician	LRC-00005357	4/26/2024

Michael Harrington

Disclaimer: This document alone should not be relied upon to confirm certification status. Compare the individual's photo and name to another valid form of government issued photo identification. Verify the individual's certification status by searching for Lead-Related Construction Professionals at www.cdph.ca.gov/programs/clppb or calling (800) 597-LEAD

State of California
Division of Occupational Safety and Health

Certified Site Surveillance Technician

Michael D Harrington

Name

Certification No. **01-3017**

Expires on **12/05/23**

This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7180 et seq. of the Business and Professions Code.

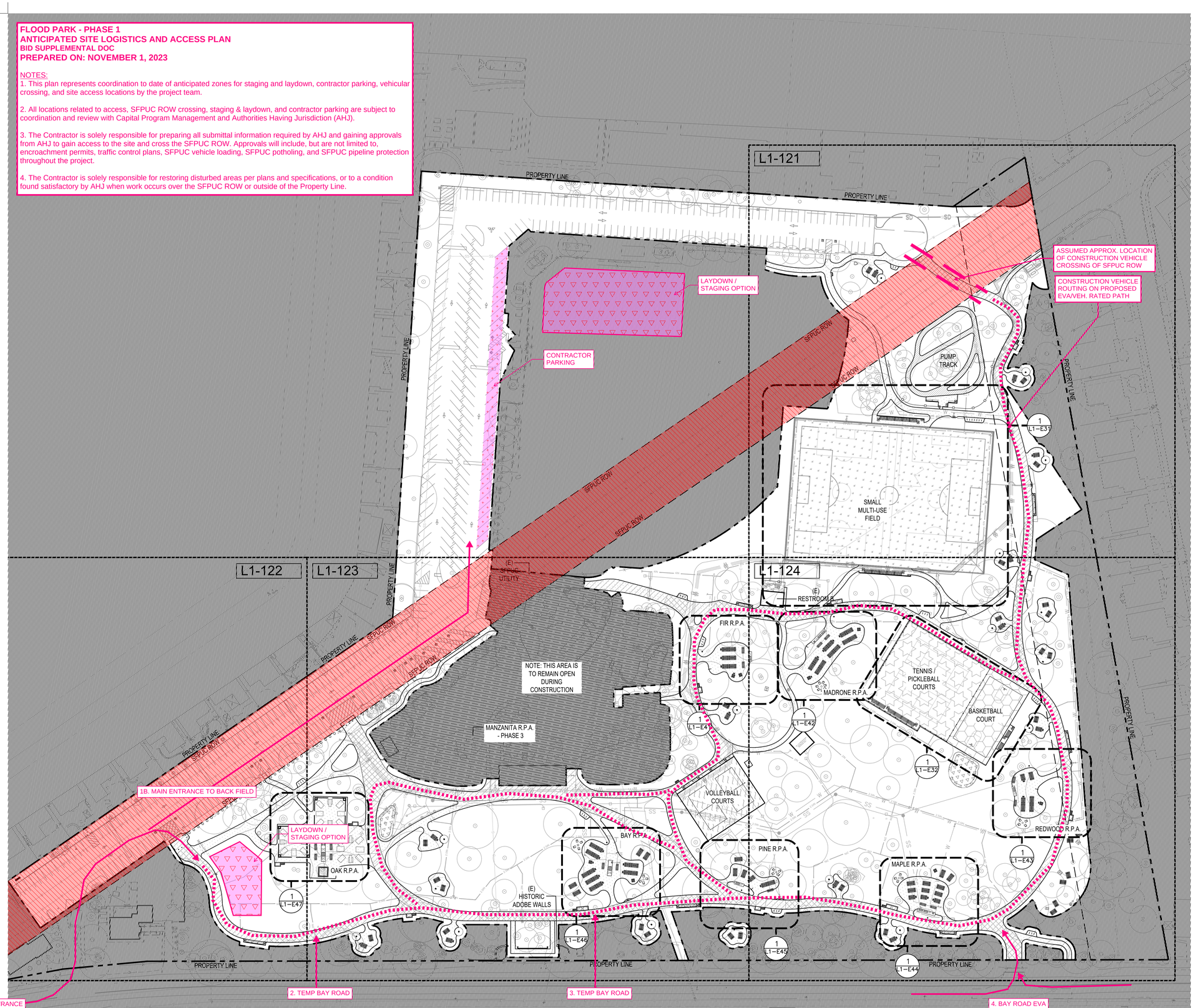
FLOOD PARK - PHASE 1
ANTICIPATED SITE LOGISTICS AND ACCESS PLAN
BID SUPPLEMENTAL DOC
PREPARED ON: NOVEMBER 1, 2023

NOTES:
1. This plan represents coordination to date of anticipated zones for staging and laydown, contractor parking, vehicular crossing, and site access locations by the project team.

2. All locations related to access, SFPUC ROW crossing, staging & laydown, and contractor parking are subject to coordination and review with Capital Program Management and Authorities Having Jurisdiction (AHJ).

3. The Contractor is solely responsible for preparing all submittal information required by AHJ and gaining approvals from AHJ to gain access to the site and cross the SFPUC ROW. Approvals will include, but are not limited to, encroachment permits, traffic control plans, SFPUC vehicle loading, SFPUC potholing, and SFPUC pipeline protection throughout the project.

4. The Contractor is solely responsible for restoring disturbed areas per plans and specifications, or to a condition found satisfactory by AHJ when work occurs over the SFPUC ROW or outside of the Property Line.



CSM 2101 - MATERIALS SCHEDULE

PAVING

TAG	SYMBOL	TYPE
P1		ASPHALT PAVING – PEDESTRIAN
P2		ASPHALT PAVING – VEHICULAR
P3		ASPHALT PAVING – VEHICULAR AT TREE ZONE
P4		DETECTABLE WARNING STRIPS
P5		STABILIZED CRUSHED STONE PAVING
P6		TENNIS COURT PAVING AND SURFACING
P7		BASKETBALL COURT PAVING AND SURFACING
P8		PUMP TRACK
P9		VOLLEYBALL SAND
P10		CONCRETE CURB
P11		SYNTHETIC TURF
P12		FLAGSTONE PAVING
P13		GRAVEL MULCH
P14		ATHLETIC FIELD CONC. PERIMETER CURB

SITE ELEMENTS

TAG	SYMBOL	TYPE
S1		SPECTATOR SEATING
S2		DRINKING FOUNTAIN
S3		WASTE RECEPTACLE
S4		BENCH
S5		ADIRONDACK CHAIRS AND RECLAIMED LOG TABLE
S6		BIKE RACKS
S7		VEHICULAR CHAINLINK GATE
S8		WIFI POLE
S9		REMOVABLE BOLLARDS
S10		
S11		
S12		
S13		PUMP TRACK FENCE
S14		TREE BRANCH BRACES

PICNIC AREAS

TAG	SYMBOL	TYPE
A1		OAK PICNIC AREA STRUCTURES
A2		REFURBISHED PICNIC TABLES (OAK PICNIC AREA)
A3		KIDS PICNIC TABLE
A4		STD. 8' PICNIC TABLE
A5		STD. 10' PICNIC TABLE
A6		NEW PEDESTAL GRILLS
A7		LARGE COUNTERTOP GRILLS
A8		SMALL COUNTERTOP GRILLS
A9		SINKS
A10		GRILL COUNTERS
A11		WOOD COUNTERS
A12		DUMPSTERS AND ENCLOSURES
A13		PIÑATA HANGERS (N.I.C)

SPORTS COURT/FIELD ELEMENTS

TAG	SYMBOL	TYPE
F1		BASKETBALL RIM, BACKBOARD, POLE AND NYLON NET
F2		TENNIS COURT FENCE
F3		TENNIS COURT NET
F4		VOLLEYBALL NET, POLE & RATCHET, J-BOLT, AND ANCHOR
F5		STORAGE SHED
F6		S12 SOCCER GOALS

1"=50' 0 12.5 25 50 100 N

cmg
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San Francisco, CA 94107
415.495.3070
www.cmgsite.com

OWNER/CLIENT
SAN MATEO COUNTY
PARKS DEPARTMENT
455 COUNTY CENTER, 4TH FLOOR
REDWOOD CITY, CA 94063

CONSULTANTS

BID SUPPLEMENTAL EXHIBIT

PROJECT NAME
FLOOD PARK
215 RAY RD.
MENLO PARK, CA 94025

PHASE
PHASE 1
CONSTRUCTION
DOCUMENTS

NO.	ISSUE	DATE
	100% SCHEMATIC DESIGN (30%)	07.18.22
	PHASE 1 - CD PROGRESS SET	10.07.22
	PHASE 1 - 75% PS&E	11.04.22
	PHASE 1 - 90% PS&E	12.09.22
	PHASE 1 - 100% PS&E BID CHK SET	03.20.23
	PHASE 1 - 100% PS&E BID SET	04.28.23

KEY PLAN

SHEET TITLE
LANDSCAPE MATERIALS PLAN

PROJECT	DRAWN BY
CSM 2101	AFO, JY, NA, AMP
SCALE	CHECKED BY
	CG, AMP

SHEET NUMBER
L1-110

FLOOD PARK - PHASE 1 - BAY ROAD EXHIBIT